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23 APRIL 1986

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**LIFE SCIENCES**  
**BIOMEDICAL AND BEHAVIORAL SCIENCES**

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AGROTECHNOLOGY

BRIEF

USING BIOLOGICAL AGENTS TO PROTECT THE FOREST--Beginning in 1972, only biological agents have been used to combat conifer- and leaf-eating pests in the forest of our republic. The chemical method used before then destroyed the pests and diseases in a large area of woods in a short period of time. However, the influence of chemical agents on wood plants and the soil had not been studied sufficiently, and often after their application, one type of pest is replaced with another, causing another outbreak. Some pests acquire immunity to poisons and become more resistant in environment conditions. With the goal of preserving valuable oaks in areas of leaf-eating pests, it is planned to use exterminating measures, employing biological agents, by 1986. Our national industry will produce them in the form of powder and paste. Experiments conducted on 14, 868 hectares of oak and coniferous plantings have shown these agents to be 70 to 95 percent effective. Biobacterial agents in applied doses are harmless for humans, warm-blooded animals, birds, plants and, also, useful insects. Therefore, I believe that in the Basic Directions project, the sentence "To strengthen control over rational usage of lumber raw material resources and preservation of forests from fires and to protect them from pests and diseases", they should add the words "primarily by means of biological methods." [Article by V. Moskovkin, senior engineer of the Chebokarya Station for protecting forests of the Chuvash ASSR Minleskhoz, "Only with Biological Methods"] [Text] [Moscow LESNAYA PROMYSHLENNOST 12 Dec 85 p 2] 12473

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CSO: 1840/241

UDC 631.811:633.11

YIELD OF VARIOUS VARIETIES OF WINTER WHEAT IN CENTRAL NONCHERNOZEM ZONE AS  
FUNCTION OF WEATHER AND FERTILIZER. REPORT 1. INFLUENCE OF MINERAL  
FERTILIZER ON YIELD OF MIRONOVSKAYA 808 WINTER WHEAT AS FUNCTION OF WEATHER

Moscow AGROKHIMIYA in Russian No 5, May 85 (manuscript received 25 Apr 84),  
pp 52-58

[Article by L. P. Volleydt and G. I. Vaulina, All-Union Order of Labor  
Red Banner Scientific Research Institute of Fertilizers and Agricultural  
Soil Science imeni D. N. Pryanishnikov, Moscow]

[Abstract] Weather factors cause wide variations in harvest in the non-chernozem zone of the USSR. This article presents results of studies using Mironovskaya 808 winter wheat conducted in 1968-1981 following a vetch-oats mixture, and 1982 following perennial grasses. The experimental area was soddy-podzolic heavy loam soil with pH 4.3-6.2, Hg 5-1.0, S 7.8-18.4 meq/100 g, V 61.0-94.0%, P<sub>2</sub>O<sub>5</sub> 5.2-10.0, K<sub>2</sub>O 9.5-14.7 mg/100 g, N<sub>tot</sub> 0.11-0.15%, humus 1.5-1.7%. Weather conditions were found to influence the duration of individual interphase periods in the wheat. Reducing the duration of periods from blossoming to full maturity was found to decrease the harvest. Mineral fertilizers have the greatest influence on yield during favorable years; under these conditions the increase in yield averaged 4.3 cw/ha following application of R90K90, 15.4 cw/ha following application of full mineral fertilizer. During dry years, only nitrogen fertilizers favorably influenced the yield. During very wet years, fertilizer resulted in reduced harvest. In all years the effect of nitrogen on the yield was virtually identical. Figures 1; tables 5; references 6 (Russian).

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CSO: 1840/1020

UDC 631.423:631.459.2

PREDICTING CONTENT OF BIOGENIC ELEMENTS IN RUNOFF FROM AGRICULTURAL FIELDS

Moscow AGROKHIMIYA in Russian No 5, May 85 (manuscript received 20 Mar 84)  
pp 73-79

[Article by Z. A. Boychenko, G. A. Chuyan and O. P. Tur, All-Union Scientific Research Institute of Agriculture and Protection of Soils From Erosion, Kursk]

[Abstract] In order to perfect a method for calculating the loss of biogenic elements from sloping fields during the spring floods, a study was made in 1978-1982 of the content of biogenic elements in spring-fall water runoff in the central chernozem zone as a function of geomorphological, soil and agricultural factors. Studies were performed in two small watersheds with areas of 20.4 and 32.0 ha. Runoff volume was measured and weighted mean liquid runoff samples were taken each day. The content of nitrate nitrogen, ammonia nitrogen and mineral phosphorus were determined. The influence of a content of nutrient substances in the soil, doses of organic and mineral fertilizer and condition of underlying surface, length, steepness and exposure of the slopes on content of biogenic elements was studied. The results showed that the concentration of dissolved biogenic elements in liquid runoff depends primarily on the content of mobile forms of nutrient matter in the soil. The content of mobile nutrient substances in the solid runoff depends on the same factors as that of dissolved biogenic elements in the liquid runoff. The content of mobile forms of nutrient substances in the solid runoff was greater than in the initial soil and varied with application of fertilizer and agricultural factors. References 6 (Russian).

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UDC: 633.11'324':[631.524+631.527

RESISTANCE OF WINTER WHEAT VARIETIES TO GRAIN GERMINATION IN EAR IN RELATION TO QUALITY SELECTION UNDER NONCHERNOZEM CONDITIONS

Moscow SELSKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian No 7, Jul 85  
(manuscript received 30 Jan 85) pp 3-6

[Article by N. S. Berkutova and L. G. Pogorelova, Scientific Research Institute of Agriculture of the Central Regions of the Nonchernozem Zone, Nemchinovka, Moscow Oblast]

[Abstract] A number of regionalized and promising varieties of winter wheat were studied for their capability to preserve initial qualities and resistance of the grain to sprouting in the ear under various climatic

conditions. Rather great differences were found among wheat varieties in terms of fall number, which is significantly influenced by growing conditions. A number of varieties formed grains with comparatively low fall number in the area tested. The varieties were ranked both according to this number and frequency of sprouting in the ear. The method of determining fall number was found to be more reliable than direct counting of the number of sprouted grains. During dry and good weather years the fall number is usually high, making it more difficult to differentiate among varieties. Some varieties were found which were relatively resistant to sprouting in the ear: Obriy, Odesskaya 76, Zirk, Promin, Prometey, Bezostaya 1, Kharkovskaya 81, Nemchinovskaya 110, Lyutestsens 72, Slaviya, Stremnina and VV 26023.

References 5 (Russian).

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CSO: 1840/1021

UDC: 635.655:[631.527+547.965

#### SELECTION OF SOY BEANS FOR AMINO ACID COMPOSITION

Moscow SELSKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian No 7, Jul 85  
(manuscript received 10 Nov 84) pp 24-30

[Article by V. I. Sichkar and A. P. Levitskiy, All-Union Selection-Genetic Institute, Odessa]

[Abstract] Studies were performed of the variability of amino acid composition of a large number of varieties of soy. The correlations among content of individual amino acids were determined and the possibility of improving the quality of protein by selection was investigated. Studies were preformed on highly productive genotypes, some of which were used in hybridization to produce promising initial materials. Large tables are presented which list the absolute content of amino acids in the grains tested. In most cases, positive correlations were found among amino acid contents, or correlations were unreliable. Correlations of content of amino acids in the proteins were lower in value and less constant than in the grains. A number of problems must still be solved to allow expedient selection to improve soy quality: donors must be found for elevated contents of the sulfur-containing amino acids and the nature of heredity of this characteristic must be studied; polymorphism of reserve proteins and genetic control of individual globulin subunits must be analyzed; genotypes of soy with variable content of 11S and 7S fractions must be determined. These studies showed that the amino acid composition of soy beans is under strict genetic control. However, the accumulation of individual amino acids also depends on the weather conditions of growing. Experimentally-created forms of soy were found for which a moderate increase in essential amino acids is characteristic.

References 13: 5 Russian, 8 Western.

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CSO: 1840/1021

UDC: 633.1:[581.167+577.21+575.113]

USE OF GENE ENGINEERING METHODS IN SELECTION OF PLANTS (REVIEW)

Moscow SELSKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian No 7, Jul 85  
(manuscript received 30 Jan 85) pp 105-110

[Article by A. V. Vershinin, Institute of Cytology and Genetics, Siberian Department, USSR Academy of Sciences, Novosibirsk]

[Abstract] This review of the (primarily American) literature discusses recent works on gene (or genetic) engineering, including attempts at experimental transfer of isolated or synthetic genes to other organisms (transgenesis), but does not discuss transfer of chromosomes between cells. The Ti plasmid is the natural genetic vector of dicotyledonous plants. Successful experiments involving transfer of genes imparting resistance to antibiotics and others using the Ti plasmid are analyzed. The difficulties arising in genetic transformation of monocotyledonous plants and development of multiple gene complex transfer methods are discussed. References 34: 2 Russian, 32 Western.

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CSO: 1840/1020

UDC: 636.085.46

BACTERIAL PREPARATIONS USED FOR SILAGE IN USSR (REVIEW)

Moscow SELSKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian No 7, Jul 85  
(manuscript received 23 Jun 84) pp 111-115

[Article by N. N. Gavrilova, Institute of Microbiology and Virology, KaSSR Academy of Sciences, Alma-Ata]

[Abstract] This review of the Soviet literature discusses the production, properties and methods of application of bacterial preparations in use in the USSR for silage. Garder was the first to use bacterial preparations (lactic acid bacterium streptobacterium plantarum) for silage purposes. Presently, most widely used in the Soviet Union are preparations made with cultures of Lactobacterium plantarum or a mixture of L. plantarum and Str. lactis. L. acidophilum has also been recommended. The preparations are recommended for preservation of a wide variety of plants, both easy and difficult to process. Improvement in biochemical characteristics is observed. The preparations are designed primarily for conservation of succulent feeds. Coarse feeds require preliminary processing. References 32 (Russian).

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CSO: 1840/1021

UDC 631:8:632.95:633.11"324"

FULL UTILIZATION OF CHEMICAL METHODS IN INTENSIVE CULTIVATION OF WINTER WHEAT

Moscow AGROKHIKIYA in Russian No 4, Apr 85 (manuscript received 19 Apr 84)  
pp 48-55

[Article by L. M. Derzhavin, Sh. I. Litvak and A. F. Chenkina, TsINAO,  
Moscow]

[Abstract] A multifaceted study was conducted on the intensification of winter wheat cultivation utilizing agricultural chemicals to their full extent. The experimental studies were undertaken in the Moscow, Lipetsk, Tambov and Ivano-Frankovsk oblasts, as well as in Krasnodar and Stavropol krays in an attempt to improve winter wheat harvests by more than 6 tons/ha of grain. The study used new strains of winter wheat, optimal fertilization, soil preparation, and weed and fungal control measures. Soil improvement was regarded as the most important factor in the study, and optimal concentrations of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O required to obtain yields of more than 50 centners/ha were defined for the different types of soil. The study demonstrated that complete adherence to the recommendations made by the agrochemical services can lead to markedly improved harvests of winter wheat, and diminish environmental pollution with nitrates despite the use of high levels of nitrogen for fertilization. References 4 (Russian).

6508/9835  
CSO: 1840/1019

UDC 581.1

EARLY DETECTION OF OVER-WINTERING OF WINTER WHEAT BY INFRARED TELEMETRY

Moscow IZVESTIYA AKADEMII NAUK SSSR. SERIYA BIOLOGICHESKAYA in Russian No 3, May-Jun 85 (manuscript received 6 Jul 83) pp 456-458

[Article by V. I. Lyalko and O. I. Kolosha, Institutes of Geological Sciences and of Plant Physiology, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] Infrared telemetry was employed in monitoring a winter wheat field in the Ukraine to assess crop losses due to freezing. The studies were conducted in the spring when the air temperature transited from 1 to 5°C, with a sensor showing a sensitivity of 0.1°C. Changes in the air temperature of the fields were based on metabolic aspects of tillering, involving utilization of sucrose and lipids as energy sources and heat production. The anomalies in field temperature generated by tillering made possible the identification of live and dead plants and early planting of spring wheat. The use of such technology may go a long way in minimizing the economic losses sustained by the loss of approximately 20% of the Ukrainian winter wheat crop due to freezing, by facilitating early planting of spring wheat. References 5 (Russian).

12172/9835  
CSO: 1840/1018

UDC 338.45:63(62.5)

IMPROVEMENTS IN ORGANIZATIONAL AND ECONOMIC ASPECTS OF AGROINDUSTRIAL ADMINISTRATION

Moscow VESTNIK SELSKOKHOZYAYSTVENNOY NAUKI in Russian No 4, Apr 85  
(manuscript received 30 Jun 84) pp 16-26

[Article by I. G. Ushachev, doctor of economic sciences, All-Union Scientific Research Institute of Agricultural Economics]

[Abstract] The 1984 Plenum of the CC of the CPSU set the tone for the transformation of Soviet agriculture into an agroindustrial complex. As a result, some 3105 rayon-level and 157 oblast-level associations have been formed in order to effect the transformation in a smooth and efficient manner. The administrative problems that have been encountered are very complex, and in many cases have been aggravated by non-adherence to established plans and hierarchical organizations. As a result, the expected degree of cooperation and coordination has not materialized, which has led to confusion in many cases and inevitably economic losses. It is evident that more hands-on experimentation will have to be conducted to assess the present administrative structures and implement further refinements.

12172/9835  
CSO: 1840/1025

UDC 63+621.039

AGRICULTURAL USE OF NUCLEAR POWER: ALL-UNION CONFERENCE ON AGRICULTURAL RADIOLOGY (OBNINSK, KALUGA OBLAST)

Moscow VESTNIK SELSKOKHOZYAYSTVENNOY NAUKI in Russian No 4, Apr 85  
pp 146-148

[Article by R. M. Aleksakhin, L. N. Sokolova and S. K. Firsakova]

[Abstract] This conference was dedicated to the 30th Anniversary of Atomic Power in the USSR, and was attended by more than 250 specialists in agricultural radiology, representing over 140 research institutions. Deputy Minister of the USSR Ministry of Agriculture, L. N. Kuznetsov, set the tone for the discussions, by summarizing the use of ionizing radiation in agriculture. At the present time various forms of ionizing radiation are utilized in the USSR in basic and applied research, including crop improvement through the use of radiation mutagenesis, preservation of various produce and grains by irradiation, and the use of radioisotopes in radioimmunoassay diagnostic methods and standard radiology in veterinary medicine. The scope of veterinary and agricultural radiology is continuously expanding, as evidenced by recent progress in crop improvement by seed

pretreatment with electric and magnetic fields. The problems pertaining to the training of agricultural radiologists were also covered, as well as selected topics in radioecology as they apply to agriculture in light of increasing environmental pollution with radionuclides.

12172/9835  
CSO: 1840/1025

UDC 631.526.002.2

INTENSIVE AND INDUSTRIAL TECHNOLOGIES IN CULTIVATION OF CROP PLANTS:  
TEACHERS' SEMINAR OF HIGHER UKRAINIAN AGRICULTURAL SCHOOLS (KIEV)

Moscow VESTNIK SELSKOKHOZYAYSTVENNOY NAUKI in Russian No 4, Apr 85 pp 148-150

[Article by V. P. Zavadskiy]

[Abstract] The Seminar was opened by N. M. Rusol, deputy minister of the Ukrainian SSR Ministry of Agriculture. The presentations summarized current state of agriculture in the Ukraine, emphasizing progress made as a result of new technological innovations. In the 11th Five-Year Plan, special efforts were made at transformation of the Ukrainian agriculture into an agroindustrial complex which, in the final analysis increased agricultural productivity by 1.5 billion rubles. In 1984 the harvest of cereal crops was increased by 3 centners/ha over 1983, and that of rice by 13.2, of corn by 0.3 and of potatoes by 6 centners/ha. All aspects of crop plant production have been affected by the implementation of new cultivation technologies, including such seemingly minor changes as the preference for caterpillar tractors to lessen soil compaction.

12172/9835  
CSO: 1840/1025

UDC: 633.1:[631.524.86+632.752.2

SPECIFICS OF BARLEY YELLOW DWARF VIRUS EPIPHYTOPSIS AND PREVENTION OF YIELD LOSS IN WINTER WHEAT, BARLEY AND TRITICALE (REVIEW)

Moscow SELSKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian No 8, Aug 85  
(manuscript received 16 Jul 84) pp 63-68

[Article by M. P. Nikolenko and L. I. Omelchenko, All-Union Institute of Selection and Genetics, Odessa]

[Abstract] This literature review discusses barley yellow dwarf disease. Systematic studies of the disease beginning in the 1970's have revealed that it is quite dangerous, but can be effectively controlled in winter

wheat, barley and triticale. Some details concerning the ecology of the parasite, symptoms of the disease and nature of development of epiphytotics are discussed. The major vector of the virus is the green bug (*Schizaphis graminum*). Many other species of aphid can also transfer the viruses, which remain viable for long periods of time in the aphids, but do not infect them and are not passed onto their progeny. Symptoms include yellowing or reddening of leaf tips, yellowing or reddening of leaves and yellowing of ears. The major preventive measure involves limiting the time the bugs are allowed to spend on plants to not over fifteen days. Aphid control is less successful in spring and summer than in fall. The use of systemic insecticides to make sprouts toxic to the bugs has been effectively used in fields heavily infested the previous fall. References 26: 11 Russian, 15 Western.

6508/9835  
CSO: 1840/1023

UDC: 633.15:631.17

INDUSTRIAL TECHNOLOGY FOR CULTIVATION OF PROGRAMMED CORN YIELD ON  
IRRIGATED LAND

Moscow SELSKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian No 8, Aug 85  
(manuscript received 22 Feb 85) pp 14-19

[Article by V. F. Kiver, V. D. Sakharov, V. M. Kunitsa, A. F. Kvyatkovsky, and I. F. Mashkin, 'Dnepr' Scientific-Production Association for Corn; All-Union Scientific Research Institute of Corn, Dnepropetrovsk]

[Abstract] A study is reported of the basic agrotechnologic approaches to growing programmed yields of corn by an industrial technology with irrigation in the steppe zone of the Ukraine. The study is based on materials obtained by field and production experiments performed by the authors and the results of other studies. The field and production experiments were performed between 1970 and 1984 at the experimental farm of the All-Union Scientific Research Institute of Corn, plus collective and state farms in the Ukraine. The studies show that optimization of the basic ecological factors for corn grown in irrigated land can achieve high yields, close to the programmed yield. One variety, with a calculated yield of 100 cw/ha, actually yielded 91.4-109.1 cw/ha in 1974-1977. The optimal technology includes irrigation, application of herbicides and fertilization including tract elements. References 19 (Russian).

6508/9835  
CSO: 1840/1023

UDC: 633.11"324":[631.524.85+631.587

HOMEOSTASIS OF WINTER WHEAT VARIETIES WITH VARIOUS MORPHOPHYSIOLOGICAL CHARACTERISTICS AS FUNCTION OF GROWING CONDITIONS

Moscow SELSKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian No 8, Aug 85  
(manuscript received 16 Jan 85) pp 39-43

[Article by A. P. Orlyuk, V. V. Basalyy and G. G. Basalyy, Ukrainian Scientific Research Institute of Irrigated Agriculture, Kherson]

[Abstract] A study is presented of the homeostasis of new varieties of winter wheat with various morphophysiological characteristics as a function of the spacing of plants, time of planting, irrigation and other factors. Semidwarf varieties are found to be more consistent in terms of grain yield than medium-height varieties, which are distinguished for the stability of ear productivity components. Selection for homeostasis can significantly improve the results of the work. Winter wheat lines developed in this study were significantly more homeostatic than Odessa semidwarf in terms of yield and other economically valuable characteristics.

References 10: 8 Russian, 2 Western.

6508/9835  
CSO: 1840/1023

UDC 575.1:578.66

MICROINJECTION OF DNA INTO HIGHER PLANT CELLS

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR. SERIYA B. GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 10, Oct 85  
(manuscript received 12 Jul 85) pp 69-71

[Article by P. V. Melnikov, T. P. Pasternak, Yu. Yu. Gleba, corresponding member, Ukrainian SSR Academy of Sciences, and K. M. Sytnik, academician, Ukrainian SSR Academy of Sciences, Institute of Botany, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] Trials were conducted on the transformation of higher plant cells by microinjection of DNA, using protoplasts derived from Nicotiana debnei callus in culture and assorted plasmids. Microinjection of the protoplasts 2-5 days after their isolation was conducted with glass micro-syringes with a ca. 1  $\mu$ m tip under hydraulic pressure to administer 1-5  $\mu$ L of buffer solution containing 0.1-1.0  $\mu$ g/ $\mu$ L of DNA. Relatively high transformation rates of 10-20% were obtained with plasmids pTiC58, pGV58 and pSV2Neo (the latter including the structural portion of neomycin phosphotransferase). Cells transformed with pSV2Neo were capable of growth in the presence of 240 mg/dm<sup>3</sup> of kanamycin, whereas cells derived from control (uninjected) protoplasts showed growth inhibition with a kanamycin

concentration of 30 mg/dm<sup>3</sup>. These observations demonstrate that micro-injections can be used as a technique for the introduction of exogenous DNA into the cells of higher plants for transformation purposes.  
References 9 (Russian).

12172/9835  
CSO: 1840/293

UDC 633.34:[581.1+631.563

ESTIMATE OF CHANGES IN VIABILITY OF SOY SEEDS IN STORAGE BY DELAYED LUMINESCENCE

Moscow SELSKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian No 6, Jun 85  
(manuscript received 14 Nov 84) pp 76-79

[Article by T. V. Veselova, V. A. Veselovskiy, V. I. Kozar and P. Z. Bochvarov, Moscow State University imeni M. V. Lomonosov]

[Abstract] A study was made of the kinetics of change in the luminescence of seeds and their sprouting rate in the process of accelerated and natural aging in order to determine the relationship between viability of air-dry soy seeds and their delayed luminescence, which can be used as a criterion for evaluation of the quality of seeds and their storage capacity. The intensity of delayed luminescence of the seeds was found to have practical value, since the luminescence of the seeds in a specific sample can be used to analyze the quality of the seeds and their capability of storage.  
References 10: 8 Russian, 2 Western.

6508/9835  
CSO: 1840/1022

UDC 631.4

SCIENTIFIC SESSION OF GENERAL MEETING OF DEPARTMENT OF BIOCHEMISTRY, BIOPHYSICS AND CHEMISTRY OF PHYSIOLOGICALLY ACTIVE COMPOUNDS, USSR ACADEMY OF SCIENCES, ON DEVELOPMENT OF SOIL SCIENCES, AGROCHEMISTRY AND SOIL RECLAMATION

Moscow POCHVOVEDENIYE in Russian No 6, Jun 85 pp 148-150

[Article by S. K. Samsonov and V. A. Obukhova]

[Abstract] The scientific session was held 18-19 December, 1984. The scientists at the session concluded that continued improvement in the diet of the Soviet people requires comprehensive study of the soil of the nation. Many problems of the reconstruction of rice fields have been solved, expert

estimates have been given of the possible results of diverting northern rivers to the south. Work has been performed on soil regionalization of the territory of the USSR, particularly the nonchernozem portion of the European USSR, Siberia and the Far East. Recommendations have been developed for the use of drainage to control salination of soils and to breakup heavy, excessively moist soil. Measures are being undertaken to prevent soil erosion in nonirrigated and irrigated agriculture. The introduction of the achievements of soil science and agrochemistry to agricultural practice is quite unsatisfactory due to serious organizational difficulties resulting from the lack of a single state soil-agrochemical and reclamation service. The results represented a summarization of data on the soil resources of the nation. The CC CPSU has called for improvement in the work of scientific institutions on the studies of problems of increasing productivity and stability of agriculture. Physical and mathematical modeling and the use of computer equipment, as well as more intensive utilization of air and space methods to study and map soils and their condition are required. The scientists of the department have called upon existing research facilities and organizations to expand theoretical and applied work directed toward radical improvement of harvest and other types of biological production. Efforts should be concentrated on the development of the theory and methods of optimization of soil processes and the creation of realistic conditions for improving fertility.

6508/9835  
CSO: 1840/1031

#### STORAGE OF PESTICIDES

Moscow ZASHCHITA RASTENIY in Russian No 10, Oct 85 pp 40-41

[Article by D. A. Lott, Laboratory Chief, All-Union Scientific Research and Planning Institute for Agrochemistry]

[Abstract] Storage of pesticides requires consideration not only of the toxicity of the substances, but also their required storage conditions to maintain effectiveness, as well as consideration of the flammability and other properties which place restrictions on the conditions of storage. This article discusses some of the specifics of storing pesticides such as magnesium chlorate, which is a strong oxidizer, and other dangerous pesticides. Pesticides should be stored on open shelves to allow easy inspection and determination of quality of containers. A photograph shows the exterior of a pesticide storage warehouse.

6508/9835  
CSO: 1840/1024

BIOCHEMISTRY

UDC 577.153:577.17

STUDY OF ECDISONE-LIKE ACTION OF TRANSFORMED POLYOXYSTEROIDS

Moscow BIOLOGICHESKIYE NAUKI in Russian No 11, Nov 85  
(manuscript received 12 Dec 84) pp 36-42

[Article by A. V. Kamernitskiy, I. G. Reshetova, V. G. Levi,  
Ye. N. Chernoburova and P. Maroy]

[Abstract] Identification and synthesis of compounds to combat various agricultural pests is a major goal of organic chemistry. Soviet research has sought to determine varying effects of polyoxysteroids of the shio-gralacton type on insect ecdisteroid receptors and the presence of ecdison-like or antihormone activity in them. Studies have concentrated on compounds with pyranone or sigma-lactone in the E ring. The present article reports on tests of steroid effects on specific ecdisteroid receptors of Ks fruit fly cells, with concurrent bonding of [<sup>3</sup>H]ponasterone with unmarked steroids. Data from the tests indicated that the structure of steroid molecules had a marked impact on the degree to which [<sup>3</sup>H]ponasterone was forced out and unmarked steroid were bonded with receptors. Results give only preliminary information on fruit fly cell-steroid interaction, but the tests suggest that ecdisteroids can have, in addition to inductive intracellular action, membranotropic activity leading to concentration of potassium ions in cells, and secondly, mechanisms of independent actions of these two types. Further research is indicated. References 12: 10 Russian, 2 Western.

12131/9835  
CSO: 1840/223

USE OF ION-SELECTIVE ELECTRODES DURING CULTIVATION OF PLANKTON ALGAE

Moscow BIOLOGICHESKIYE NAUKI in Russian No 11, Nov 85  
(manuscript received 19 Oct 84) pp 105-109

[Article by N. G. Bulgakov, Ye. I. Gorshkova and N. V. Revkova]

[Abstract] In recent years ionometric analysis has found increasing application to soil studies, agrochemistry and hydrochemistry. The method has advantages in permitting increased automation, and in its harmlessness for the tested materials. The present article reports on study of the suitability of using nitrate and ammonium ion-selective electrodes under varying conditions for growing phytoplankton. Replication and efficiency of testing methods were assessed. The authors used indicator electrodes to determine ion concentrations of  $\text{NO}_3^-$  and  $\text{NH}_4^+$  of EM- $\text{NO}_3$ -01 and EM- $\text{NH}_4$ -01 brands. These are liquid membrane electrodes with high selectivity. Determination of  $\text{NO}_3^-$  was hampered only by the presence of  $\text{I}^-$  and  $\text{Br}^-$  ions. Accuracy of measurement was 2.1 to 3.6%, regardless of the concentration of ions, and the method was found to be very quick, as in the test for *Scenedesmus quadricauda*, which was cultivated and tested in 13 days. The need for filtration was eliminated, thus speeding the process, and very small concentrations could be used in measuring nitrogen nitrate and ammonium use by cells. The tested electrodes were highly selective thanks to which calibrated solutions could be prepared using distilled water. References 5 (Russian).

12131/9835  
CSO: 1840/223

PHOTOCHEMICAL BREAKDOWN OF CERTAIN INSECTICIDES

Moscow AGROKHIMIYA in Russian No 5, May 85 (manuscript received 18 Jun 84)  
pp 97-101

[Article by T. M. Petrova, All-Union Institute of Protection of Plants,  
Leningrad]

[Abstract] Studies are reported of the photochemical breakdown of chlorinated organic, organophosphorus and pyrethroid insecticides. The major photochemical reactions of insecticides are considered to be isomerization, hydrolysis, oxidation, substitution and sensitization. The influence of such factors as wave length of light, presence of water, oxygen and organic matter, natural sensitizers, pH, etc., was studied. It was found that photochemical reactions of pesticides may result in detoxication of the substances, but also in the formation of products more toxic than the initial substances. Nontoxic conversion products may have undesirable

long term effects on living organisms. This indicates the need for careful study of the conversion of pesticides under various conditions and determination of the most important factors governing the processes. References 40: 16 Russian, 24 Western.

6508/9835  
CSO: 1840/1020

UDC 632.95

#### PREDICTIONS OF DEGRADATION OF PESTICIDES AND OTHER ORGANICS IN SOIL FROM THERMODYNAMIC CONSIDERATIONS

Moscow AGROKHIMIYA in Russian No 4, Apr 85 (manuscript received 29 Jun 84)  
pp 87-93

[Article by M. S. Sokolov, V. I. Terekhov and R. V. Galiulin, North Caucasian Scientific Research Institute of Phytopathology, Krasnodar; Institute of Pedology and Photosynthesis, USSR Academy of Sciences, Pushchino]

[Abstract] Enthalpy considerations were applied to a study on the soil degradation of pesticides and other organics in relation to moisture content and temperature conditions, proceeding from the temperature spectra of action of mesophilic and psychrophilic microorganisms. From standard thermodynamic formulations, an equation was derived yielding a parameter  $\beta$ , which described the degradability of an organic compound in the solid-compound system and had the dimensions  $\text{kg} \cdot \text{kcal}^{-1}$ . Tabulated values of  $\beta$  are provided for a variety of xenobiotics, which in fact corresponds to the rate of humification of natural organics under natural soil conditions. The fact that a direct correlation prevails between the rate of degradation of a xenobiotic in the soil and its enthalpy indicates that degradation of agrochemicals can be controlled by regulating the moisture content of soils.

References 36: 25 Russian, 11 Western.

12172/9835  
CSO: 1840/1019

MATERIALS ON SECTIONAL CHEMOTAXONOMY OF RHOEADIUM SPACH (GENUS PAPAVER)

Leningrad RASTITELNYYE RESURSY in Russian Vol 21, No 3, Jul-Sep 85  
(manuscript received 20 Apr 84) pp 316-324

[Article by V. A. Chelombitko and A. D. Mikheyev, Pyatigorsk Pharmaceutical Institute; Botanical Institute imeni V. L. Komarov, USSR Academy of Sciences, Leningrad]

[Abstract] In view of the accumulated information on the alkaloids produced by the Rhoeadium Spach section of the Papaver genus, an analysis was conducted on the section to determine whether it should be subdivided into two sections. Analysis of the alkaloid composition of the species in the Rhoeadium section indicated that the biochemical data support a reanalysis of present taxonomy and that it would be of advantage to divide the section into two: Rhoeadium Spach and the proposed Dubia Micheev (Mikheyev). In general terms, alkaloids with 17 carbon atoms predominated in Rhoeadium Spach, whereas 16 carbon atom alkaloids predominate in Dubia Micheev. Analysis of the individual components suggests that the Rheadium section represents a more ancient subdivision than the Dubia section.

References 74: 1 Polish, 12 Russian, 61 Western.

12172/9835  
CSO: 1840/1037

SYSTEMS APPROACH TO RATIONAL MANAGEMENT OF MEDICINAL PLANT RESOURCES

Leningrad RASTITELNYYE RESURSY in Russian Vol 21, No 3, Jul-Sep 85  
(manuscript received 6 Jul 83) pp 364-374

[Article by S. G. Sboyeva, First Moscow Medical Institute imeni I. M. Sechenov]

[Abstract] A systems analysis was applied to the supply and demand for medicinal plants in the USSR, to assure adequate supplies at reasonable costs. The basic approach was to apply the systems theory to this branch of the medical industry to assure more efficient operation of the entire process, proceeding from the research conducted by the International Institute of Applied Systems Analysis. Beginning in 1973, the Institute commenced studies on the development of ecology-based management of natural resources, on solution of specific methodological problems, and on the creation of regional projects. In such endeavors, wide use is made of analytical methods, as well as of econometric and optimizational models, and system behavior analyses. In the USSR, procurement of medicinal plant raw materials involves the integration of a variety of ministries (USSR Ministry of Health, USSR Ministry of Medical Industry, etc.) as well as

other branches of state economy (e.g., USSR State Forestry). Much of the procurement and studies conducted by such establishments are based on financial arrangements with various scientific research establishments and educational institutions. At the present time the procurement organizations can spend about 3% of their income on evaluating wild-plant resources. The coordination of the activities of all the procurement organizations is the responsibility of the Interdepartmental Council (Soviet) on the Study, Rational Utilization and Protection of Medicinal Plants of the USSR of the USSR Ministry of Medical Industry. It appears that a more efficient administrative structure would result if a special administrative body were to be created within the USSR Council of Ministers, akin to the Higher Council on National Economy which was created in 1921, with counterparts in the individual Soviet Republics, and expanding down to oblast and rayon levels. References 32 (Russian).

12172/9835  
CSO: 1840/1037

UDC: 576.7+576.36

TEMPORARY DISAPPEARANCE OF G<sub>2</sub>-CHALONE FROM BASAL LAYER OF REGENERATING EPIDERMIS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 285, No 6, Dec 85  
(manuscript received 26 Jun 85) pp 1451-1453

[Article by S. A. Ketlinskiy and A. S. Simbirtsev, All-Union Scientific Research Institute of Highly Pure Biological Preparations, Leningrad]

[Abstract] Monospecific antibodies for epidermal G<sub>2</sub>-chalone are used to perform immunomorphologic analysis of changes in histotopography of the inhibitor in rat epidermis regenerating after trauma. Regeneration of the skin of the back of white rats was induced by plucking the hair under ether narcosis. Materials were taken for study at intervals from one hour to eight days. Immunomorphologic analysis was performed using antibodies to epidermal G<sub>2</sub>-chalone. During the early prereplicative period, during preparation of the cell for the mitotic cycle, epidermal G<sub>2</sub>-chalone disappears from the cells of the basal layer, i.e., from the population of cells which begins to proliferate after trauma and replenishes the cell mass by regenerative hyperplasia. Entry of the epidermocytes into the mitotic cycle probably depends on the significant reduction in intercellular concentration of G<sub>2</sub>-chalone, not a decrease in its production in the differentiated delta as has been theoretically suggested.

References 13: 6 Russian, 7 Western.

6508/9835  
CSO: 1840/292

UDC: 547.963.32

EFFECTIVE ALKYLATION AND SPLITTING OF SINGLE-STRAND DNA FRAGMENT AT  
PREDETERMINED STRUCTURAL SITES BY COMPLEMENTARILY ADDRESSED MODIFICATION

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 285, No 6, Dec 85  
(manuscript received 8 Apr 85) pp 1475-1478

[Article by Ye. B. Brosalina, V. V. Vlasov, I. V. Kuytavin, S. V. Mamayev,  
A. G. Pletnev and M. A. Podyminogin, Novosibirsk Institute of Bioorganic  
Chemistry, Siberian Department, USSR Academy of Sciences]

[Abstract] Complement-addressed modification, modification of nucleic acids by reactive oligonucleotide derivatives forming complementary complexes with known nucleotide sequences, makes it possible to perform chemical transformations at arbitrarily selected sectors on the nucleic acids. This article presents a detailed study of complement-addressed modification of a single-strand DNA fragment by means of alkylating derivatives of various oligonucleotides. The data obtained indicate that oligonucleotide derivatives carrying a 4(N-2-chloroethyl-N-methylamino) benzylamine group at the 5' terminal phosphate can achieve highly directed complement-addressed modification of single-strand polynucleotides. The use of the reactive groups provides for selective modification and the reaction with piperidine were high enough that alkylation of oligonucleotide derivatives could be used to obtain the necessary fragments of single-strand DNA. References 14:; 11 Russian, 3 Western.

6508/9835  
CSO: 1840/292

UDC: 577.151.51+577.117.3

ACTIVITY OF CYTOCHROME R-450-DEPENDENT RAT LIVER ENZYMES UPON ADMINISTRATION  
OF TETRA-PHENYL PORPHYRIN (Fe<sup>3+</sup>)

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR: SERIYA B: GEOLOGICHESKIYE,  
KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 11, Nov 85  
(manuscript received 25 Mar 85) pp 79-82

[Article by O. N. Stefanskaya, S. A. Andronati, N. Ya. Golovenko,  
corresponding member, UkrSSR Academy of Sciences, B. N. Galkin, Z. I. Zhilina  
and I. S. Vershenya, Odessa State University]

[Abstract] The authors point out that many studies of the regulation of activity of cytochrome R-450-dependent enzymes have been published. Two groups of substances are known which change the activity of monooxygenases: genetic (phenobarbital, methylcholanthrene  $\beta$ -naphthoflavon), which induce de novo synthesis of certain forms of cytochrome R-450 (LM<sub>2</sub> and LM<sub>4</sub>) and physical-chemical modulators such as pH, high concentration of organic

solvents and detergents. Since macrocyclic complexons similar in structure to porphyrins change the reaction rate of oxidation of xenobiotics catalyzed by cytochrome R-450 and the hemoprotein contains tetrapyrrol and the iron ion, the authors have studied the influence of tetraphenyl porphyrin ( $Fe^{3+}$ ) on the activity of monooxygenases and peroxide oxidation of liquids in white rat hepatocytes. On one-time administration of TPP( $Fe^{3+}$ ), the content of protein in the microsomal fraction increases by 40%, the level of RNA decreases by 22%. The results can be explained by assuming that when TPP ( $Fe^{3+}$ ) is administered, the activity of hemoxygenase, which regulates the concentration of porphyrins in the organism, may increase. Synthetic metalloporphyrins are promising compounds, not only as biochemical tools, but also as physiologically active agents. References 12: 5 Russian, 7 Western.

6508/9835

CSO: 1840/256

BIOPHYSICS

UDC: 577.344:541.145:579.852.13

COUPLING OF INORGANIC SEMICONDUCTOR PHOTOCATALYSTS WITH CLOSTRIDIUM CELLS;  
PHOTOGENERATION OF HYDROGEN

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 285, No 6, Dec 85  
(manuscript received 29 Jul 85) pp 1467-1471

[Article by A. A. Krasnovskiy, academician, V. V. Nikandrov and  
S. A. Nikiforova, Institute of Biochemistry imeni A. N. Bakh, USSR  
Academy of Sciences, Moscow]

[Abstract] A system is described in which particles of inorganic semiconductor photocatalysts such as TiO<sub>2</sub>, ZnO and CdS coupled with Clostridium butyricum cells containing hydrogenase methylviologen, which in the reduced state can penetrate lipid membranes, are used to coordinate electron transfer between semiconductor particles and bacterial cells. The most effective photogeneration of hydrogen was observed in tris-TiO<sub>2</sub>-methylviologen-clostridium cell systems. The hydrogen was confirmed to be gaseous hydrogen by gas chromatography. Two forms of hydrogenase are apparently active during the experiments: one bonded with the cells, one leaving the cells during cell breakup. The experiments are of interest not only for the design of photobiotechnological systems, but also as models of possible paths of prebiological evolution. Nonbiological components of the earth's crust have been demonstrated to be usable as photocatalysts in the process of chemical evolution. References 9: 6 Russian, 3 Western.

6508/9835  
CSO: 1840/292

## BIOTECHNOLOGY

### LATVIAN INSTITUTE OF MICROBIOLOGY RECOGNIZED FOR CONTRIBUTIONS TO BIOENGINEERING

Riga NAUKA I TEKHNIKA in Russian No 8, Aug 85 p 2

[Report by O. Sarma and photographs by V. Zhivets: "Bioengineering for the National Economy"]

[Text] The end of last year saw the publication of a report about the awarding of the republic's Lenin Komsomol Prize to L. Baburin and U. Kalneniyeks, staff members of the Institute of Microbiology of the Latvian SSR Academy of Sciences. The two young scientists who received such recognition are from the bio-engineering laboratory directed by Uldis Ernestovich Viyestrus, an honored inventor of the Latvian SSR, a corresponding member of the Latvian Academy of Sciences, and a doctor of engineering sciences. The staff of this large organization includes chemists and bio-chemists, biologists and microbiologists, physicists and bio-physicists, radio engineers, cyberneticists, as well as specialists in instrument building, automation, and computer technology. Therefore, essentially the entire laboratory had won recognition.

Work here is carried out in two directions. One involves the study of the principles of the growth and biosynthesis of microorganisms and the other, the creation of equipment for cultivating microorganisms. These parallel areas of research are continually intersecting so that when a new piece of equipment appears, it satisfies the needs not only of the institute, but also of industry (see the information in "Nauka i tekhnika" in Nos. 4 and 6, 1985). While instruments and equipment are adjusted during experiments, this practical experience also provides concrete guidance for each of the fermentation processes. And further still. The knowledge obtained by studying microbiological concentrates can be useful for research conducted with other amorphous products.

The bio-engineering laboratory has particularly close ties with the Livani Experimental Biochemical Plant and other enterprises in producing lysine. Thanks to recommendations developed by scientists, the capacity at the plant has grown by a factor of 2.6 since 1972.

The scientists have not rested on their laurels. A second section for the Livani plant and several plants in other republics have been planned. Once put into commission, they will allow for improvements in the technical and economic indices of production and for the development of a lysine

concentrate for livestock breeding with less waste of raw materials. A start has been made on original designs for experimental and industrial fermenters.

Testimony to the laboratory's scientific authority and its sizeable contribution to practical operations is its close collaboration with the country's many scientific institutions and machine building enterprises, and its fruitful contacts with scientists of the Comecon countries as well as the USA and Finland. For example, recently in Burgas (Bulgaria) the Fifth International School of Mathematical Modelling took place and experts from Comecon countries listened very attentively to Professor U. E. Viesturs's plenary paper "Trends in the Development of Bio-engineering and Fermentation." New working ties were established and licensing agreements were concluded.

Many books and brochures written by the laboratory staff members have been published in Riga and Moscow. This speaks on behalf of the laboratory's extensive scientific authority.

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13085/9835  
CSO: 1840/207

BRIEF

BIOTECHNOLOGY IN PLANT AND LIVESTOCK FARMING--Sofiya--A long-range program of collaboration between the USSR and PRB to the year 2000 has foreseen incorporating new, more progressive technology into production in plant and livestock farming, including biotechnology. A specific department has been created for this in Bulgaria. In Plovdiv, the specialized organization "Biotehnika" has been established for accelerated development of biotechnologies and their use on farms. In nearby Sadovo, a genetic "bank" is in operation, which collects plant seeds from many countries of the world, which are necessary for selections. Scientists of the Sadovo Institute of Introduction and Plant Resources are conducting promising experiments. Here they are developing a direction of modern genetic engineering, such as cellular plant reproduction. They have obtained encouraging results for cultivating non-viral planting material of potatoes and garden cultures, along with grapes and roses. New methods in livestock farming are also becoming more noteworthy. Before the end of the year, it is intended to put 14 centers for agricultural animal embryo transplants into operation. [Article by L. Ahmyrev, "With the Aid of Biotechnology"] [Text] [Moscow PRAVDA 18 Nov 85 p 4] 12473

/9835  
CSO: 1840/241

ENVIRONMENT

UDC: 575.24

MUTAGENESIS IN LOCALLY CONTAMINATED HUMAN ENVIRONMENT

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 285, No 5, Dec 85  
(manuscript received 2 Jul 85) pp 1213-1215

[Article by A. I. Korytova, O. F. Mikhaylov and N. P. Dubinin, Institute of General Genetics imeni N. I. Vavilov, USSR Academy of Sciences, Moscow; University imeni 300th Anniversary of Union of the Ukraine with Russia, Dnepropetrovsk]

[Abstract] Studies have indicated that 10.5% of neonates have hereditary deviations from normal development. This work studies the mutagenic influence of gaseous emissions in the vicinity of a coke-chemical facility, using a laboratory test system consisting of root cells from growing seeds of *Crepis capillaris* as well as leaves from a number of trees and bushes, acting as a biosphere test system. The influence of gas emissions was studied at various distances from the point of the emissions. The number of mutations in the cells of the plants at 150, 800-900, 1500 m and 12 km were noted. The data clearly show that, in areas where mutagenic production wastes are injected into the environment, they increase the number of mutations in organisms inhabiting large areas around the point of emission. The number of such points on the planet is quite large. Monitoring of mutations in organisms in areas selected as biospheric test systems is suggested. References 15: 9 Russian, 6 Western.

6508/9835  
CSO: 1840/290

## EPIDEMIOLOGY

UDC 616-006.4(470.23)"1964-1984"

### INCIDENCE OF MALIGNANT TUMORS IN LENINGRAD

Leningrad VOPROSY ONKOLOGII in Russian Vol 31, No 6, Jun 85  
(manuscript received 2 Apr 85) pp 17-21

[Article by L. M. Gulyeva, (deceased), K. A. Pavlov, L. S. Serova, and S. S. Yaritsyn, USSR Ministry of Health Order of Red Banner Scientific-Research Institute of Oncology imeni Professor N. N. Petrov, Leningrad Oncological Dispensary: "Incidence of Malignant Tumors in the Population of Leningrad Over 20 Years"]

[Text] For many years a well-organized oncological service has existed in Leningrad, and the system of registering patients fairly accurately reflects the actual incidence of malignant tumors in the population (1). We present the incidence of malignant tumors in the population of Leningrad in a dynamic form over 20 years for the census years 1959, 1970, and 1979 (Table 1).

The material used was the data of reports on illness caused by cancer and other malignant tumors (Form No 61, confirmed by the Central Statistical Administration) in Leningrad from 1958-1959, 1969-1970, and 1978-1979. The indicators of disease rate were calculated based on the average annual number of diseases registered for the first time over 2 years (the year preceding the census and the year following the census). The reliability of the differences in the indicators presented in this work was determined using the Student criterion ( $P_t$ ).

In Leningrad, the number of patients registered for the first time in their life with malignant tumors more than doubled in 20 years, and the intensive indicator of disease rate rose by a factor of 1.5, reaching 293.2 per 100,000 in 1979 (MSKB [transliteration]--140-209). This level substantially exceeded ( $P_t < 0.01$ ) the unionwide average data (201.6 cases of malignant tumors per 100,000 inhabitants in 1979) and the data for the RSFSR--227.1 per 100,000 (2-4).

The very substantial reduction of the average yearly rate of growth of the disease indicator from 1971-1979 (2.8 percent) compared to the period from 1959-1970 (7.1 percent) calls attention to itself. At the same time, for some localizations not only was there a reduction in the rate of increase but also a reduction in the absolute level of the disease (esophagus, stomach, cervix, lips), as a result of which the structure of the incidence of disease changed. Cancer of the stomach remained in first place, as before, and lung cancer in second place, however, while in 1959 the number of cases of stomach

cancer was more than 3 times greater than the number of cases of lung cancer, in 1979 this figure was only 1.4 times. Esophageal cancer moved from third place to eighth place, behind breast cancer, skin cancer, and cancer of the colon. The ratio between cervical and breast cancer changed drastically. The incidence of breast cancer was almost 3 times greater than the incidence of cervical cancer.

Table 1--Incidence of Illness Caused by Malignant Tumors in the Population of Leningrad During Census Years (Basic Localizations)

Локализации (1)	(2)		1959		1970		1979		показатель наглядности в % (5)
			число впервые зарегистрированных больных злокачественными новообразованиями	показатель наглядности в %	число впервые зарегистрированных больных злокачественными новообразованиями	показатель наглядности в %	число впервые зарегистрированных больных злокачественными новообразованиями	показатель наглядности в %	
	(3) абс. число	(4) на 100 тыс.	(3) абс. число	(4) на 100 тыс.	(3) абс. число	(4) на 100 тыс.	(3) абс. число	(4) на 100 тыс.	
(6) Всего злокачественных новообразований (140—199)	5925	178,4	100	10 109	256,0	143,5	12 926	281,6	157,8
(7) В том числе:									
(8) полости рта	56	1,7	100	127	3,2	188,2	256	5,6	329,4
(9) губы	60	1,8	100	56	1,4	77,8	73	1,6	88,9
(10) пищевода	606	18,2	100	552	14,0	76,9	477	10,4	57,1
(11) желудка	1932	58,2	100	2564	64,9	111,5	2645	57,6	99,0
(12) прямой кишечник	163	4,9	100	492	12,5	255,1	780	17,0	347,0
(13) горлани	81	2,4	100	150	3,8	158,3	206	4,5	187,5
(14) трахеи, бронхов, легкого	625	18,8	100	1384	35,0	186,2	1872	40,8	217,0
(15) шейки матки	572	17,2	100	503	12,7	73,8	524	11,4	66,3
(16) молочной железы	487	14,7	100	880	22,3	151,7	1321	28,8	195,9
(17) кожи	398	12,0	100	614	15,5	129,2	873	19,0	158,3
(18) кроме того: лимфатической и кроветворной ткани	—	—	—	459	11,6	100,0	530	11,6	115,5
(19) Итого злокачественных новообразований (МКБ 140—208)	—	—	—	10 568	267,6	100,0	13 456	293,2	109,6

Key:

1. Localizations
2. Number of patients registered for the first time with malignant tumors
3. Absolute number
4. Per 100,000
5. Indicator of obviousness, in %
6. All malignant tumors (140—199)
7. Including:
8. Oral cavity
9. Lips
10. Esophagus
11. Stomach
12. Rectum
13. Larynx
14. Trachea, bronchial tubes, lungs
15. Cervix
16. Breast
17. Skin
18. Additional: lymphatic and hematogenic tissue
19. Total malignant tumors (ICD) 140—208)

These changes in the intensity and structure of the incidence of malignant tumors can be regarded to a certain degree as the result of shifts in demographic processes. During the 20 years under investigation, the age-gender structure of the population of Leningrad underwent substantial changes in the direction of "aging" the population. In order to eliminate the influence of changes in the age composition of the population, we calculated standardized indicators (Table 2; the age structure of the population of Leningrad in 1959 was taken as the standard).

Table 2--Incidence of Malignant Tumors, Main Localizations, in Men and Women of Leningrad (Per 100,000 in the Corresponding Population)

<u>Localizations</u>	Men					
	Ordinary Indicators			Standardized Indicators		
	<u>1959</u>	<u>1970</u>	<u>1979</u>	<u>1959</u>	<u>1970</u>	<u>1979</u>
All malignant tumors	149.6	236.4	266.6	219.8	256.9*	253.1*
Including:						
Oral cavity	2.4	4.7	9.1	2.9	5.2	9.1
Lips	3.3*	2.5*	3.0*	4.4	3.0*	2.9*
Esophagus	14.1*	11.9*	9.2	22.4	13.4	8.6
Stomach	55.9	65.8	61.7	82.0	71.5	58.3
Rectum	3.6	10.0	15.1	5.2	11.0	14.0
Larynx	5.2	7.5	9.4	6.8	8.2*	9.4*
Trachea, bronchial tubes, lungs	34.0	63.8	72.7	48.2	68.4*	69.5*
Skin	8.7	12.1	15.4	12.7*	13.0*	14.6
Breast	0.3*	0.1*	0.6	0.4	0.1	0.6
Women						
<u>Localizations</u>	Ordinary Indicators			Standardized Indicators		
	<u>1959</u>	<u>1970</u>	<u>1979</u>	<u>1959</u>	<u>1970</u>	<u>1979</u>
	198.7	270.8	293.5	167.4	180.4*	182.4*
All malignant tumors						
Including:						
Oral cavity	1.2	2.1	2.8	0.9	1.5*	1.7*
Lips	0.7*	0.6*	0.5*	0.6*	0.4*	0.2*
Esophagus	21.1	15.6	11.3	17.0	8.6	5.2
Stomach	59.8	64.2	54.5	49.3	38.4	28.7
Rectum	5.8	14.3	18.5	4.8	9.00	11.0
Larynx	0.5	1.0*	0.7*	0.4*	0.7*	0.4*
Trachea, bronchial tubes, lungs	8.1	13.2	15.9	6.9*	7.9*	8.3*
Skin	14.3	18.2	21.9	11.8*	12.7*	14.3*
Breast	24.8	39.1	50.7	21.8	30.0	38.7
Cervix	29.4	22.4*	20.3*	25.1	17.4	14.3

\* The difference between the indicators is not reliable ( $t < 2$ ).

A comparison of the standardized indicators allows us to establish that the substantial growth of intensive indicators of the illness rate and their high level is largely the result of the "aging" of the population. If the age structure of the population in 1979 is correlated with the age structure of the population of Leningrad in 1959, the levels of incidence of malignant tumors (ICD-140-199) among women and men have a tendency to stabilize (Fig. 1).

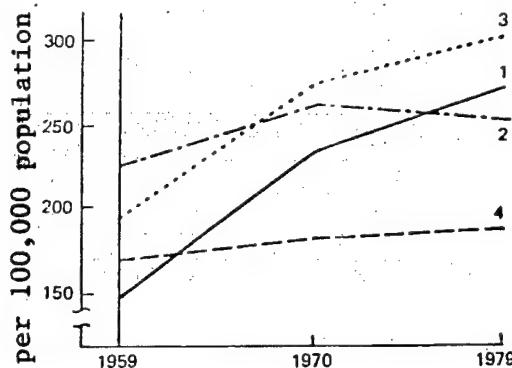


Fig. 1. Dynamics of ordinary and standardized indicators of the incidence of malignant tumors in the population of Leningrad. 1, 2--men (1--ordinary indicator; 2--standardized indicator); 3, 4--women (3--ordinary indicator; 4--standardized indicator).

The levels of incidence of malignant tumors (not including tumors of the lymphatic and hematogenic tissue) in women in 1979 was higher (293.5 per 100,000) than in men (266.6 per 100,000,  $P_t < 0.01$ ), but calculating standardized indicators allowed us to establish that these differences mainly depend on differences in the age structures of the male and female population (the standardized indicators of the incidence are 253.1 per 100,000 for men, and 182.4 per 100,000 for women).

The rate of increase of the incidence of malignant tumors both for men and women declined in the last decade. From 1959 to 1970 there was an average annual increase of eight new patients per each 100,000 men, while from 1971 to 1979 the corresponding figure was only one new patient, which means that the average annual increase calculated as a percent was 5.2 percent for men up to 1970 and 1.4 percent up to 1979, while for women the figures were 4 percent and 0.9 percent, respectively. But this trend is not uniform when we speak of individual localizations of the malignant process. For example, for cancer of the esophagus and stomach there was a reduction of the indicators in all age groups both for men and women, and for cancer of the colon, breast, skin, trachea, bronchial tubes, and lungs, the levels of the indicators increased in practically all age groups of the population.

The increased level of the rate of oncological disease in the population of Leningrad, and also the definite advances in the field of early diagnosis of tumors and increased effectiveness of methods of treatment, is promoting a swelling of the ranks of oncological patients. Every year, about 50,000 patients with malignant tumors are under dispensary observation, which corresponds to 1068.5 patients per 100,000 in the population (1979); almost exactly one inhabitant out of every 100 is under dispensary observation in connection with a malignant tumor.

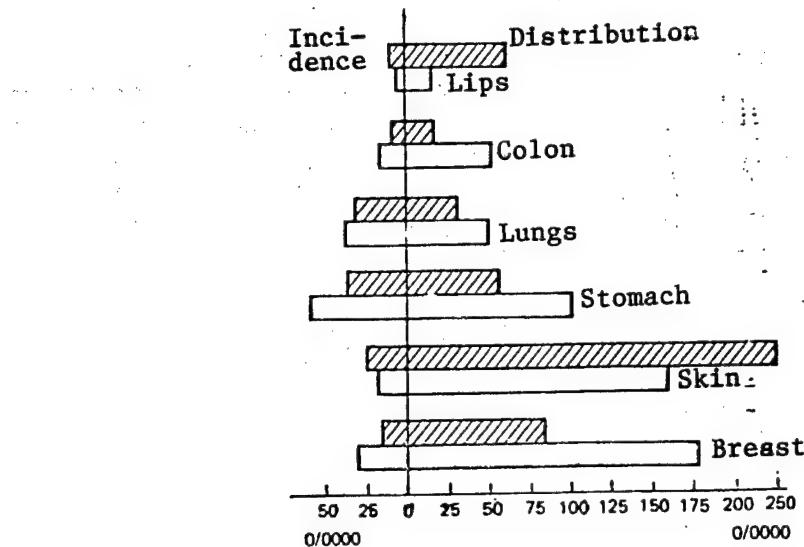


Fig. 2. Incidence and distribution of malignant tumors in Leningrad (plain bars) and among the urban population of the USSR (shaded bars) in 1979.

Table 3--Dynamics of Distribution of Basic Localizations of Malignant Cancers Throughout the USSR and the City of Leningrad

(1) Локализация	(2) Территория	Число больных со злокачественными новообразованиями, состоящих на учете онкологических учреждений на конец соответствующего года (на 100 тыс. населения)				Среднегодо- вой абсолютный прирост (убыль) показателя за 1970—1980 (4) гг.
		1970	1975	1979	1980	
(5) Все злокачественные новообразования	СССР, (14) Ленинград	604,3 826,6	726,5 956,5	812,9 1068,5	836,0 1092,4	+23,2 +26,6
(6) В том числе:	(15)					
(7) пищевод	СССР, Ленинград	5,9 12,9	5,7 10,5	5,7 8,9	5,7 8,7	-0,02 -0,4
(8) желудок	СССР, Ленинград	59,2 107,5	60,9 105,2	60,4 104,9	60,6 102,5	+0,1 -0,5
(9) прямая кишка	СССР, Ленинград	10,2 32,4	14,5 43,0	18,9 53,0	20,2 54,7	+1,0 +2,2
(10) легкое	СССР, Ленинград	19,0 38,4	24,4 44,7	29,6 53,4	31,3 54,2	+1,2 +1,6
(11) кожа	Ленинград	117,5	139,4	160,2	164,7	+4,7
(12) молочная железа	СССР, Ленинград	53,1 145,8	69,5 175,3	83,9 203,3	88,2 207,8	+3,5 +5,3
(13) опухоли лимфатической и кроветворной ткани	СССР, Ленинград	12,6 24,8	18,6 29,1	22,4 33,7	23,4 34,9	+1,1 +1,0

Key:

1. Localization
2. Territory

3. Number of patients with malignant tumors included in the records of oncological establishments at the end of the corresponding year (per 100,000 of the population)
4. Average annual absolute growth (decrease) in the indicator from 1970-1980
5. All malignant tumors
6. Including:
7. Esophageal
8. Stomach
9. Colon
10. Lung
11. Skin
12. Breast
13. Tumors of the lymphatic and hematogenic tissue
14. USSR
15. Leningrad

In the last decade the indicator for new patients increased by 28.9 percent (826.6 per 100,000 in 1970). It should be noted that in Leningrad the picture of the distribution of malignant tumors among the population has its own special characteristics and is substantially different from unionwide data (Table 3). In Leningrad there is a fairly high level of patients suffering from malignant tumors of the breast, lungs, and digestive organs, especially the stomach and colon; at the same time these indicators are relatively low for cancer of the oral cavity and throat, lips, and skin. These differences are explained to a certain degree by the particular characteristics of the levels of incidence (Fig. 2). At the same time, a specially calculated coefficient--the index of accumulation (the ratio of the number of ongoing patients to the number of first-time patients-- $I_{ac}$ )--in Leningrad is fairly high. For example, the  $I_{ac}$  of patients suffering from breast cancer in Leningrad in 1979 was 7.9, while at the same time this index for the urban population of the country reached only 4.8. It should be noted that the index of accumulation of patients depends on an entire set of factors (the quality of diagnosis and treatment of patients, the form of localization, and so forth), but no small role is played by the quality of dispensary observation of oncological patients.

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12255

CSO: 1840/217

## GENETICS

### ACCELERATION OF ANIMAL GROWTH WITH HUMAN GENES

Moscow TRUD in Russian 1 Nov 85 p 4

[Article by I. Mogila, "Geneticists Accelerate Growth: Scientists Conduct Unique Experiment"]

[Text] The USSR Academy of Sciences Institute of General Genetics, conjointly with the USSR Academy of Sciences Institute of Experimental Medicine, have developed a method to accelerate growth of animals. The order to "grow faster" is injected with a special syringe into a single-solitary cell, and then the entire body conforms to it.

The enigma of dwarfs and giants has not given people any rest from century to century. It has even been attributed to dark forces. Why do some grow like yeast and others remain small forever? Scientists have synonymously managed to answer this question, having discovered and studied the growth hormone, a protein polypeptide. It seems that an abundance or deficiency of this protein in the body determine a deviation in growth rate.

The development of a young science--genetic engineering--has made it possible not only to isolate, but also to synthesize growth hormone genes. Biotechnological methods have aided in learning how to introduce this gene into bacteria, and they have been converted into genuine hormone factories. Based on bacterial cells, it has been possible to obtain it in sufficient quantities.

But even in medicine, which does not consider money, when it concerns a person's health, the method for obtaining the growth hormone is considered expensive. And what if we decide to use it in agriculture on thousands and thousands of animals? After all, it is so tempting to produce entire herds of cattle which grow and gain weight several times faster than usual. But the high price of the agent makes the entire effect worthless. So then the idea came up to inject this gene into an animal only once, so that the quick growth trait could be transferred by heredity. Such a method could warrant all expenditures. This idea has triggered a long series of experiments...

In the eye of the microscope, I clearly saw the tiny vitreous needle pierce the wall of the embryonic cell. A movement of the micrometer propeller, and the dimicron needle point neared the necessary area. Another instant

passed, and the micro-injection was accomplished. A human growth hormone was introduced into an ordinary mouse gene. Just as an operator inserts the program disc into his computer in order to enact its assigned program, here, the injection of a living cell has assigned a new program of development. Now this embryo cell is introduced into the mouse, and soon she will give birth to seemingly ordinary mice. But in the genetic code of each of them will be recorded the inflexible order, "Grow faster!" And the little mice obediently comply, in spite of the fact that this command was given to them by people and will be accomplished by a human growth hormone which is foreign to them.

Why was a human chosen to be the donor in this unusual operation? The choice was arbitrary enough. Mice have their own growth hormone. But in order to make them grow faster, it is necessary to introduce a more active program. The slightly changed gene of the human growth hormone fits this requirement exactly.

In the vivarium of the genetic engineering laboratory, I was shown graphic results of previous experiments. The mice, removed from cages, flashed their beady eyes and puffed their whiskers... Some of them were much bigger than the others. I would have taken them for parents with their baby mice. But the description on the cage definitely said that they had all been born on the same day. The small ones were the control group. They were used to compare and determine how the "mechanical spring" of growth acceleration, implanted in their neighbors, worked.

Having held the unusual mouse-accelerator in my hands, I carefully put it back in its cage. "If that one runs away, it could cause people quite a bit of damage", I thought. "And its descendants will grow and multiply considerably faster."

The living results of the experiments were convincing enough. But how close have the experiments come in practice?

"Our methods of accelerating animals' growth has already been developed enough that it can be transferred to experiments on large agricultural animals," answered Aleksey Alekseyevich Sozinov, director of the Institute of General Genetics and USSR Academy of Sciences and VASKhNIL academician. "The actual use of this method could have a great economic effect. It will accelerate the reproduction process of cattle, and less feed will be needed... But this is only one aspect of this most interesting complex task which is occupying genetic engineers in the laboratory."

As a matter of fact, injecting genes does not only accelerate growth. After matching and combining the injected genes, it is possible to produce any desired trait in an animal. If one were to take a cow, for example, then inject her with a genetic program of additional casein genes, it could enable her to produce a substantially greater amount of milk. This trait would also be passed on from generation to generation. This laboratory

is also working on another fantastic project. Can you imagine the cow as a living medicine manufacturer? After consuming ordinary meadow grass or hay, she will be secreting insulin or interferon, or all of the same human growth hormones...depending upon which program was injected into her. These medicinally valuable bioactive compounds will accumulate in the milk and one will simply have to milk the animal in order to obtain them.

12473/9835  
CSO: 1840/240

IMMUNOLOGY

UDC 616-006.446-07:576.8.097

USE OF MONOCLONAL ANTIBODIES IKO-GM-1 TO DIAGNOSE ACUTE NON-LYMPHOBLASTIC LEUKEMIA

Leningrad VOPROSY ONKOLOGII in Russian Vol 31, No 7, Jul 85  
(manuscript received 21 Feb 85) pp 79-83

[Article by M. A. Kryzhanov, N. N. Tupitsin, Ye. V. Savalyeva, Yu. V. Shishkin and T. S. Drozdova, All-Union Scientific Center for Oncology, USSR Academy of Medical Sciences, Moscow]

[Abstract] The monoclonal antibodies (MKA) IKO-GM-1, IKO-11, IKO-1, IKO-2, and IKO-10 were used to study the phenotype of blastic cells from 38 patients suffering from five different subtypes (FAB classification) of acute nonlymphoblastic leukemia. Blood cells from the bone marrow of the patients were separated using a standard technique. Expression of the antigens on the blastal membrane was evaluated in an indirect reaction of surface immunofluorescence on an Opton (FGR) photomicroscope III. IKO-1 was used against monomorphic Ja-type antigens; IKO-2 against undifferentiated blastic cells; IKO-10 against early T-cell precursors; and IKO-11 against antigens of natural killer cells. The IKO-GM-1 antibody was obtained by somatically cross-hybridizing spleen cells from mice immunized twice with leukocytes from the blood of myelomonoblastic leukemia with myeloma cells from mice. The data showed that IKO-1, IKO-GM-1, which exposed an antigen common to myeloid and macrophagal cells, and IKO-11 are the most characteristic monoclonal antibodies for acute non-lymphoblastic leukemia. IKO-2 and IKO-10 also helped to expose antigens of three subtypes of this disease. In view of the above, integrated immunological and cytochemical examination of the blastic cells of patients suffering from acute non-lymphoblastic leukemia is a valuable diagnostic tool. References 11: 5 Russian, 6 Western.

13050/9835  
CSO: 1840/218

EFFECT OF SPLEEN CELLS FROM TUMOR-BEARING MICE ON ALLOTRANSPLANTATION IMMUNE RESPONSE

Leningrad VOPROSY ONKOLOGII in Russian Vol 31, No 7, Jul 85  
(manuscript received 19 Feb 85) pp 87-91

[Article by A. L. Spasokukotskiy, Institute for Problems of Oncology imeni R. Ye. Kavetskiy, UkrSSR Academy of Sciences, Kiev]

[Abstract] An experimental model based on the immunization of mice with allogenic cells was used to study the influence of spleen cells from tumor-bearing mice on the allotransplantation immune response in vivo. The tumors were induced by injecting mice with 1 mg of 20-methylcholanthrene and were differentiated according to the duration of the carcinogenic latent period. Spleen cells from these mice were syngenuically transferred to healthy mice either locally or systemically. It was established that spleen cells from tumor-bearing mice can suppress the transplantation immune response to allogenic cells injected into intact syngenic recipients, thereby indicating the presence of suppressor cells in the splenocytes. The nature of the suppressor cells' activity can, evidently, depend on the duration of the carcinogenic latent period in the immunoregulatory cell donors. Splenocyte activity was found to depend on the rate of tumor growth and on whether the immunoregulatory cells were transferred locally or systemically. The model helped to determine that there is a dependence between the growth rate of chemically-induced neo-tumors and the ability of spleen cells from tumor-bearing mice to modify the immune response to the allo-antigens.

References 9: 4 Russian, 5 Western.

13050/9835  
CSO: 1840/218

MEDICINE

SHORTAGE OF BANDAGING MATERIALS FOR MINISTRY OF HEALTH

Moscow IZVESTIYA in Russian 25 Oct 85 p 3

[Article by A. Chernichenko: "Cotton, Bandages, and Percentages", under the rubric "Health-Care Services: Experience and Problems"]

[Text] It began with deputy ministers writing to each other. The Deputy Minister of Health sent a letter to the Deputy Minister of Light Industry: "For a number of years, the constantly growing demand of the health-care services for bandaging materials has been seen to in an extremely poor fashion. In 1985, 81 percent of the demand for bandages was met, 37 percent of the demand for sterile dressings, 29 percent of the demand for packaged bandages, four percent of the demand for gauze-and-cotton pads, and 1.5 percent of the demand for sterile bandages... In this regard, we are providing you with information on the Ministry of Health's demand for bandaging materials. Please look over this information as quickly as possible while thinking of how this demand can be fully met."

An answer came in three months. The Deputy Minister of Light Industry informed the Ministry of Health that, because of a lack of productive capacity and insufficient capital allocation, only 60 percent of the medical profession's demand for medical gauze, 64 percent of its demand for raw cotton, and 26 percent of its demand for packaged cotton could be met by the end of the 12th Five-Year Plan.

Then the ministers started a correspondence. The Minister of Health wrote a letter to the minister of light industry:

"Concerning increasing the production of bandaging materials from 1986 to 1990. The Ministry of Health has repeatedly consulted with the Ministry of Light Industry on the problems of increasing the output of bandaging materials produced by your enterprises. However, judging by your latest letter, production of bandaging materials will either increase insufficiently or not at all, and the Ministry of Health cannot accept this state of affairs."

The reply came a month later: "Concerning the allocation of productive capacity for the production of bandaging materials. The Ministry of Light Industry has examined the proposals of the Ministry of Health and (here the same figures as those contained in the deputy minister's letter are recited--the author). Further increases in the output of bandaging materials

is constrained by a lack of productive capacity and an insufficient allocation of capital for the 12th Five-Year Plan.

We live in a fast-paced world and, unfortunately, one in which the risk of injury is very high. The demand for bandaging materials is truly growing. They are needed not only in surgical departments and medical clinics, but in every household, in our everyday existence. It is no accident that, statistically, bandaging materials are a product for which demand is high. One-half of the country's total production of bandaging materials goes to meet the needs of the medical profession; the other half is sold to consumers. Both halves are in short supply.

We are expanding the production of minerals, developing new areas, and not a single miner, without violating safety regulations, can go into a mine-shaft without his personal package of bandages. Every 24 seconds, a brand-new Zhigulenok rolls off the line at the Volga Automotive Plant (VAZ), but any GAI (State Automobile Inspection) inspector will halt it at the gates of the plant if it does not have a first-aid kit. It is practically useless to try and con an inspector. But, in a modern surgical clinic, it is even more useless to try and staunch the flow of blood with words. Other means have to be applied, including bandages. But how can this be done, if only 61.5 percent of the Ministry of Health's orders for styptic gauze will be filled this year?

Several ministries are responsible for meeting the requirements of the medical professions for dressings. The Ministry of Light Industry provides medical gauze and cotton wool, which today serve as the basic raw materials for the manufacture of bandaging materials: bandages, dressings, pads, tampons, and so forth. This year, the Ministry of Health received exactly one-half of the cotton wool that it asked for. Moreover, only 18 percent of it reached pharmacies and medical institutions in packaged form. The rest arrived in bales and packages weighing between 30 and 50 kilograms apiece. Hospital and pharmacy personnel had to break open the bales and package the cotton to sell or use. This means that, every year, pharmacy personnel alone have to manually weigh and wrap two hundred million packages of cotton.

Between 1980 and 1981, the Ministry of Industrial Engineering for Light and Food Industries was supposed to deliver 36 cotton packaging lines to the Ministry of Light Industry. To date, two have been delivered.

This year, the Ministry of Light Industry filled 59 percent of the Ministry of Health's orders for medical gauze. As usual, two thirds of it went to the Ministry of the Medical Industry for processing into bandages, and the other third went to medical institutions in the form of cloth 90 centimeters wide. Here, something must be understood: both gauze cloth and coiled bandages are essentially semi-finished bandages. Finished bandages are medicated. Therefore, it turns out that from 85 to 90 percent of the bandages made in this country are produced in semi-finished form, from which, once again, hospital personnel and consumers manually make the finished products. In addition to this colossal waste of time and labor there is one other negative aspect--this kind of cottage industry uses up a lot of gauze.

The basic shortage of gauze and cotton brought about by the Ministry of Light Industry affects the other suppliers of the Ministry of Health. In 1985, the Ministry of the Medical Industry delivered 81 percent of the bandages ordered and 30 percent of the personal medical kits; The Ministry of the Timber and Paper Industries--45 percent of the sanitary kits; and the Ministry of Construction Materials--40.5 percent of the plaster bandages.

As the earlier-quoted letter from the Minister of Light Industry indicates, one cannot expect the situation to improve during the 12th Five-Year Plan. There really is not enough productive capacity, and to build them will take both time and money, not to mention the raw materials they would need if they did not exist, specifically cotton. It is, of course, possible to lobby for this. The ministries can continue to write letters to each other. However, it does not appear that this convoluted path will help the bandage business.

In the middle of the current five-year plan, the USSR State Committee on Science and Technology formed a temporary commission on science and technology that was given the task of analyzing the current situation with bandages and developing recommendations for using technology to solve the problem. The commission fully and conscientiously carried out its duties. The result of the commission's work is a report outlining recommendations for solving the problem by looking at what other countries have done and by evaluating trends in this branch of industry.

The main recommendation stated that it is necessary to substitute special polymers for cotton as a raw material for bandages. Whereas in the Soviet Union, cotton's share in the raw material base for this industry if 85.5 percent, it barely exceeds 25 percent in foreign industrialized nations.

The transition from cotton to polymers would be a qualitative jump in the development of the health-care services. Bandages made primarily of gauze and cotton, and which comprise the majority of the materials used in this country, belong to the first generation of bandages, with which mankind has long been familiar. In the meantime, advances in chemistry, biology, and medicine made it possible to begin producing the second generation of bandages in the second half of the last decade. These are known as biologically active materials, which not only protect the wound, but also treat it and speed up the healing process. They are manufactured using adhesive polymer tapes.

The commission's report provides a table which classifies the different types of dressings produced here and abroad. The first part of the table contains the names and uses of the various materials: first-aid bandages, materials for treating burns and traumatic injuries, and therapeutic bandages. The second part of the table lists the output of foreign companies: numerous types of single- as well as multi-layered bandages for various types of wounds, based on adhesive films containing biologically active polymers. (It is especially noteworthy that cotton gauze is practically never used.) The third part of the table contains brackets enclosing the following: "We have nothing like it. Gauze and gauze-and-cotton bandages

are used." As a result, the report states, instead of finding the desired solution to the problem of bandaging materials, increasing the quality of health care, and relieving the demand for cotton, which is a valuable raw material, a shortage of medical gauze of approximately 500 million cubic meters will persist throughout the 12th Five-Year Plan.

Some materials have been developed in this country, and they have even been approved for production. It has even been calculated how much cotton would be saved by the extensive production of, for example, LPO (adhesive polymer tape for dressing surgical wounds) or LPP (adhesive bandaging tape). It is likely that just as much would be saved by using what A. Sorokin, Deputy Minister of the Medical Industry showed me, having removed it from a shelf in his office. It was a spray, which, when applied to a wound, forms a strong, protective, and therapeutic coating. There was also a tape made from a polymer with a sea buckthorn additive. The tape is applied directly to a wound and speeds the healing process, after which it is absorbed by the tissue. This eliminates the need to tear it off, as would have to be done with a bandage that had dried to the skin. However, the can which contained the spray carried a label on which was typed "test product".

The report by the GKNT (State Committee on Science and Technology) commission concluded with recommendations directed towards four of the national ministries: the Ministry of the Medical Industry, the Ministry of the Chemical Industry, the Ministry of Health, and the Ministry of Light Industry. On the basis of scientific and technological work that has been done within the Ministry of the Medical Industry in anticipation of developing adhesive tapes and special polymers, it is recommended that a united, purposeful, and integrated scientific program to start and develop the domestic production of medical products based on adhesive tapes be drawn up during the course of 1983(!). This program should be presented to USSR Gosplan and to the GKNT.

To date, no one has started to work on this program. One would think that this could not be put off, since effective measures to continue improving the quality of health care have been prepared for the coming five-year plan, and since the decision has already been made to develop the use of chemical applications to solve medical problems. The ministries involved are arguing about the numbers which have to be figured into the part of the new five-year plan dealing with the production of bandaging materials, but once again they are talking about conventional first-generation materials. This is happening even though it is clear that health-care needs and the requirements of scientific and technological progress demand a qualitatively new approach to the resolution of an old problem.

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CSO: 1840/109

## BRIEF

STOMATOLOGY EXHIBITION IN MOSCOW--The "Stomatology-85" Exhibition has opened in Moscow. This is the first exposition of its type in our nation. Thirty firms from capitalist countries are participating in it. ...A metal syringe, placed on the usual pen, indicated the West German firm "Bayer": a thin needle is injected about a millimeter into the gum, and then the anesthetic is sprayed into tissue under high pressure. In the first place, this method is practically painless, and secondly, it makes it possible to reach directly to the affected area and to inject only the minimum drug. A new "generation" of anesthetics is demonstrated by a series of the firm "Steptodent" from France, the speciality in the fact that they do not contain adrenaline, so they may be used for cardiovascular system illnesses. New instruments, dental office equipment, X-ray machines, alloys, ceramics and plastics for prostheses and work places for stomatologists, achieved with consideration of ergonomic requirements, were brought to Krasnaya Presnya by firms of Austria, Switzerland, Finland and other countries. [Article by V. Beletskiy, "For the Physician and Patient"] [Text] [Moscow TRUD in Russian 22 Nov 85 p 4] 12473

/9835  
CSO: 1840/241

BOOK: SURGERY WITHOUT A SCALPEL

Moscow KHIRURGIYA BEZ SKALPELYA (NOVOYE V ZHIZNI, NAUKE, TEKHNIKE: SERIYA "MEDITSINA") in Russian No 11, Nov 1985 pp 2, 52-55

[Annotation, table of contents, and section on pp 52-55 from the book "Surgery Without a Scalpel", compiled by V. N. Budylin, Izdatelstvo "Znaniye", 64 pages]

[Text] Annotation

It is the opinion of most people that the scalpel is the surgeon's primary tool, which he introduces into the body to alleviate a person's suffering. However, there also exist surgical interventions which are bloodless. Contemporary technological capabilities, such as lasers, endoscopes and ultrasonic rays, make it possible to perform much surgery without using conventional techniques. This booklet gives an overview of the ways in which the scientific-technological revolution is assisting health care. The booklet is intended for medical professionals and medical students.

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The Soviet Union Presents

In this selection we will talk about some of the exhibits, presented at the Soviet section of the Third International Specialized Exhibition "Health Care-1985".

The electrical high-frequency surgical apparatus EKhVCh-550 is designed for penetrating soft tissues with the simultaneous coagulation of blood vessels by means of high-frequency electrical currents. It can be used in either a cutting or a coagulating mode, or a combination of the two.

The electrical high-frequency surgical apparatus for gynecology EKhVCh-180-1G is used for operating on soft tissues, and coagulation of blood vessels in gynecology. It provides a "soft" incision and a high quality of operation. The apparatus has automatic blocking, thereby preventing an electrical shock to the patient and medical personnel. It does not require protective grounding. The apparatus has a broad range of monopolar and bipolar instruments.

Ultrasonic medical surgical equipment UZUM 7-Kh is used for conducting surgery on biological tissues: incisions on soft tissues, treatment of bone tissues, separation of layers of soft tissues from each other, separation of soft tissue from the bone, stopping hemorrhages at a capillary level, and treatment of suppurative wounds.

The ultrasonic apparatus for hand surgery UZKh-F-01-T is designed for operating on soft tissue, cartilage, and bone tissue, osteotomy and bougirage in conducting traumatological hand surgery. It has an automatic system of maintaining the amplitude of oscillations of the instrument during the operation, as well as a sound signal about the absence of oscillations of the instrument. The apparatus includes two acoustic assemblies with the set of six interchangeable instruments which make possible their alternate usage during an operation.

Ultrasonic surgical equipment URSK-7N-18 is designed for ultrasonic treatment of biological tissues. Its working frequency is 26.5 KHz; amplitude of longitudinal oscillations of the moving tip of the instrument is 30 mc.

A set of urological instruments and apparatus "Baykal-2" is used for dissolving, extracting and guiding stones out of the ureters without surgical intervention. The set is equipped with a set of small lithotriptors which facilitate dissolving both stationary and floating stones in the ureter as well as protecting the ureter's walls against the ultrasound's dissolving effect. Total time of dissolving a stone is 5-60 seconds.

The apparatus for administering polymer foam splints is used for administering foam splints for the purpose of transportation and treatment through creating a rigid frame of the cravat bandage type for fractures, dislocations and other traumas. The apparatus uses a two-component system of the "Foamtran" type in producing the material for foam splints. The apparatus provides the exact dosage, feeding and mixing of the ingredients of the system to achieve the consistency suitable for administering and forming the splints directly on the area of the trauma. The mixing time of the system's ingredients is 15-20 seconds, and the hardening time is 5-10 minutes.

A cryogenic electrical coagulator for a flexible gastroscope with fiber optics KEK-1 is designed for cryogenic influence and electrical coagulation

of pathological formations on the stomach and duodenum surfaces. The temperature of the stream at a distance of 1-30 mm from the probe's nozzle is (-30)-(-50)°C.

Apparatus for artificial circulation AIK-6.05 (ISL-5) is designed for a temporary substitution of the heart's pumping function and the lung's breathing function during heart and major vessel surgery. It provides the measurement of the maximal arterial blood pressure and the temperature of the blood, the rotation frequency and output volume of the roller pumps, digital indication of the operation time, as well as the dosage of gases by means of a pneumatic feeder.

The assisting circulation apparatus "Sinus VK2" is used for treating patients with acute heart failure in cardiology clinics. It provides the implementation of methods of bypassing the heart's ventricles, direct mechanical massage of the heart and arterial-arterial perfused counter-pulsation; cardio-synchronized blood circulation with general perfusion in conditions maximally close to physiological conditions; phase synchronization with the heart's functioning according to a preset delay and the duration of pumping; regulation of the wave slope of the influencing impulses; visual control of the KEG's shape and of the pressure diagram in the air chamber of the apparatus.

The apparatus for ultrasonic surgery UZKh-201 is used in ophthalmological surgery during operations on the eyeball, orbit, tear ducts, as well as facial plastic surgery. It makes it possible to conduct such operations as dacryocystorhinostomy, plastic bone orbitotomy, orbitotomy in connection with neoplasms, plastic surgery in connection with scar deformation of the eyelids layer-by-layer keratoplasty in connection with cataracts of the cornea, anti-glaucoma operations, removing of tumors of the ciliary body, reconstructive surgery of the frontal part of the eye, etc.

Laser equipment "Sayany-MT", "Romashka-1", "Skalpel-1" with laser surgical instrument "Skalpel-2" guarantees total asepsis during surgical operations on gastrointestinal organs and bile-ducts, plastic surgery and gynecological interventions as well as in treatment of suppurative and infected wounds. It makes it possible to conduct operations with minimal blood loss, to speed up operations, and to decrease post-operative pain. Along with making incisions, one can perform a biological "welding" of the organ which has been operated upon.

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12971/9835  
CSO: 1840/222

## CONTROL OF DISSEMINATED SCLEROSIS

Moscow TRUD in Russian 5 Dec 85 p 4

[Article by L. Klyukin, Moscow, interview with Doctor of Medical Sciences Vladimir Alekseyevich Karlov, professor at the Department of Mental Disorders of the Moscow Institute of Medical Stomatology, under the rubric "Medicine and Life"; date and place not given]

[Excerpts] Our correspondent conducted an interview with Doctor of Medical Sciences V. A. Karlov, professor in the Department of Nervous Disorders of the Moscow Institute of Medicine and Stomatology and head of a team of authors who have come up with a new method of treatment [for disseminated sclerosis].

[Answer] In our country, for example, an average of 4 persons out of 10,000 suffer [from this disease].

[Answer] In disseminated sclerosis there are disturbances not only of immunity but also of hemostasis, i.e., the system which maintains the correct proportions of all the components of the blood. Our method of treatment is to correct the disturbance of hemostasis. We have selected a complex of drugs which eliminate changes in the blood and vascular system. This reduces the exacerbation, and then the disease progresses in less severe form.

[Answer] Even though we cannot yet completely save a patient from the disease, his life will be easier.

[Answer] Processing of results have shown that the method was 80 percent effective.

[Answer] So far the method is still only being employed at our own clinic, in the departments of neurology of Moscow Municipal Hospital No. 6.

9832/9835  
CSO: 1840/235

DRUG TO COMBAT ALCOHOL ABUSE

Moscow LENINSKOYE ZNAMYA in Russian 31 Jul 85 p 3

[Article by A. Rylov, candidate of medical sciences [interviewer]]

[Abstract] The reported interview was conducted to explore experimental medicine's contribution to the implementation of the CPSU Central Committee's resolution on combatting drunkenness and alcoholism. Interviewed was Yuriy Valentinovich Burov, professor of medical sciences and head of the section on neuropharmacology of the Institute of Pharmacology, USSR Academy of Medical Sciences. The discussion centered on attempts to develop a medication that would interfere with the desire to drink. Experiments were conducted using rats. Studies at the institute of the Academy of Medical Sciences on alcohol's effects on the nervous system have been underway since 1975, when Corresponding member Irina Perovna Anokhina proposed existence of nervous predispositions toward alcohol abuse or abstinence. The effects of drunkenness and sobering up have been duplicated in the test rats, and Soviet scientists have experimented with a "medicinal brake" for previously tested ethanol-oxidizing enzymes that reduce human resistance to alcohol. Their efforts have focussed on "teturam" and similar preparations synthesized at the institute and tested on its rats. Some promising compounds are being prepared for clinical tests. The content of endogenous alcohol has been shown to be in inverse relationship to the propensity to alcoholism in rats, and tests to confirm this in humans are planned. While some genetic link appears to exist, Professor Burov does not believe it to be a decisive factor. Similarly, he regards the scientific pharmacological approach to be only part of a solution to alcohol abuse.

12131/9835  
CSO: 1840/2072

UDC: 616.12+616.13/.14]-036.11-073.781/.781

CARDIOLOGIC REMOTE-CONTROLLED CONSULTATIVE DIAGNOSTIC CENTER

Moscow KARDIOLOGIYA in Russian Vol 25, No 7, Jul 85 pp 5-9

[Article by E. Sh. Khalfen, director, Saratov Affiliate, Leningrad Scientific Research Institute of Cardiology, RSFSR Ministry of Health]

[Abstract] New organizational and methodologic approaches are required to allow broad-scale, massive electrocardiography of the population without requiring workers to lose time on the job. The use of modern achievements of electronics and automation, particularly the creation of remote-controlled consultative offices based on hardware capable of transmitting EKG over telephone or radio links, can be of great assistance in solving this problem. In 1967, in cooperation with a group of engineers, headed by O. M. Radyuk, the author developed a system for telemetric transmission of biological information, particularly EKG, over telephone and radio links. The result was instruments designed for transmission of EKG over telephone channels and their recording in consultative centers. Telemetry systems for remote transmission of EKG are also manufactured abroad. A number of therapeutic institutions in the USSR use the "Ultrans" system manufactured in Finland, known as the NOKIA-710 system. Experience has indicated it is quite useful to equip physicians in the field with portable EKG transmitters. All rayons of Saratov Oblast are now equipped with EKG telephone transmitters. In 1983 alone, 11,580 consultations were performed using these devices at the author's Institute.

6508/9835

CSO: 1840/1013

## MOLECULAR BIOLOGY

### EDUCATION OF SOVIET MOLECULAR BIOLOGISTS

Moscow ZNANIYE-SILA in Russian No 11, Nov 85 pp 10-12

[Excerpts from article by Y. Levina, candidate of biological sciences, "High School for Native Molecular Biologists"]

[Excerpts] One of the currently prevailing school-seminars for specialists--the Annual School for Problems in Molecular Biology--conducted by the Scientific Council at the Department of Biochemistry, Biophysics and Chemistry of Physiologically Active Compounds of the USSR Academy of Sciences--noted its twenty years of existence in April 1985.

Participants of each meeting of this school gather in the "Zvenigorodskiy" Hotel to attend lectures on current questions of their science. Often, the lectures attract a large auditorium of participants on the thematic day to hear either virologists or immunologists, or those interested in the latest news in bioenergetics. They come here to spend a few days in a creative atmosphere of discussions, spend some time with colleagues from other institutes, converse with people outside of work whom they see only in work conditions, discuss experimental problems and new ideas, hear another opinion about one's work which might not be published yet or to absorb an outside opinion, hear an "amateur" question from colleagues from an allied field, a question diverting the problem with an unexpected viewpoint...

The great Leningrad biologist, Professor V. Y. Aleksandrov, one of the school's founders, in his lecture "Biology and Biologists in Molecular Biology", voiced a thought, taken up by many of the speakers: methods of molecular biology can successfully solve a problem, which, as a rule, is prepared and formulated by biologists who work not with separate, and, consequently, still--or already--"non-living" molecules, but with whole life forms, primarily with cells, because it is precisely the cell which is the center of all molecular processes, the primary basis of living forms.

Professor G. I. Abelev discussed with Doctor of Biological Sciences N. N. Voytenkiy, his colleague from Minsk, an example of another fundamental biological problem, the immune response mechanism, first formulated by biologists on a cellular and even organism level, and successfully being tested now by methods of genetic and cellular engineers, methods which are extremely comprehensive chemical, physical and molecular-biological procedures.

Academician Dmitriy Georgiyevich Knorre, a Novosibirsk chemist who has been working in molecular biology for a long time, elicited quite a sensation in the auditorium with his lecture. First, the scientist exposed--and deposed--the already outdated, but still recently wide-spread opinion of biologists that the role of chemistry in molecular biology is to a significantly degree an applied role. Further, Dmitriy Georgiyevich discussed the broad introduction of chemical approaches into molecular biology, the necessity of comprehending complex enzymic reactions in the cell from the position of quantum chemistry and the active application in molecular biology of chemical modeling. Superimposing the principle of classical chemistry on a biological problem--it is necessary to study the relation of structure and function of the investigated object--has turned out to be extremely fruitful in molecular biology. After all, its central problem--the problem of proteins and nucleic acids recognizing one another, which makes up the essence of regulation processes on all levels of life--fundamentally rests on this principle.

[At the end of the 50s, Soviet scientists] finally overcame the underestimation, existing in the 1940's and 1950's, of the necessity to introduce chemistry and physics methods into biology, and scientific biology was freed from the preponderance of dogmatic schemes. Fundamental centers of molecular biology had already arisen in the Soviet Union: the Radiobiology Department of the Institute of Atomic Energy imeni I. V. Kurchatov (now the USSR Academy of Sciences Institute of Molecular Genetics), the Institute of Physical-Chemistry and Radiation Biology under the direction of Academician V. A. Engelgart (now the USSR Academy of Sciences Institute of Molecular Biology) and the Institute of Chemistry of Natural Compounds under the direction of Academician M. M. Shemyakin (changed to the USSR Academy of Sciences Institute of Bioorganic Chemistry imeni Shemyakin). A center for biological research was erected in Pushchino-on-the-Oka, and the Moscow State University Interdepartmental Laboratory of Molecular Biology was established. The year 1965 was noted by the publication of G. Watson's book "Molecular Biology of the Gene". Interest in molecular biology grew quickly, and the necessity of a school with a wide profile was dictated by the very nature of the new science, which was created inevitably from the problem of developing a common language.

Initiators of the formation of the first school were then young scientists, and now they are the well-known specialists O. B. Ptitsyn, L. L. Kiselev, Y. S. Lazurkin, A. A. Vazina and T. M. Birshteyn. The school was supported by a Scientific Council, which created its ideological direction, and until recently has operated under the direction of Academician Vladimir Aleksandrovich Engelgart.

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12473/9835  
CSO: 1840/233

UDC 547.963.32

3372 NUCLEOTIDE RNA SEQUENCE OF HEPATITIS A VIRUS CODING FOR CAPSID VP4-VP1  
AND NONSTRUCTURAL PROTEINS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 285, No 4, Dec 85  
(manuscript received 14 Oct 85) pp 1014-1016

[Article by Yu. A. Ovchinnikov, academician, Ye. D. Sverdlov, corresponding member, USSR Academy of Sciences (AS), S. A. Tsarev, S. G. Arsenyan, T. O. Rokhлина, V. Ye. Chizhikov, N. A. Petrov, G. G. Prikhodko, V. M. Blinov, S. K. Vasilenko, L. S. Sandakhchiyev, corresponding member, USSR AS, Yu. Yu. Kusov, V. I. Grabko, G. P. Fleyer, M. S. Balayan and S. G. Drozdov, full member, USSR Academy of Medical Sciences; Institute of Bioorganic Chemistry imeni M. M. Shemyakin, USSR AS, Moscow; All-Union Scientific Research Institute of Molecular Biology, Novosibirsk; Institute of Poliomyelitis and Viral Encephalitides, USSR Academy of Medical Sciences, Moscow]

[Abstract] Conventional methodology was employed in the cloning of cDNA obtained by reverse transcription of RNA of hepatitis A virus (strain HAS-15). The resultant library of some 2000 clones was analyzed for insertions coding for structural hepatitis A virus structural proteins. The latter technique utilized two deoxyribonucleotide probes corresponding to two different regions of sequences coding for VP1 protein. A clone with a 3372 nucleotide-long fragment was identified, which was identified to code for a portion of a poly-protein functioning as a precursor of capsid proteins VP4-VP1. The specific area was represented by the sequence 2400-2500 nucleotides, with the remainder possibly coding for nonstructural proteins. In addition, a short fragment (495-631) coded a part of the VP1 protein and contained a nonessential deletion. References 10: 1 Russian, 9 Western.

12172/9835  
CSO: 1840/254

UDC: 577.2+547.963.32.07

MOLECULAR CLONING OF HUMAN GENES CODING TUMOR NECROSIS FACTORS: TANDEM PLACEMENT OF  $\alpha$  AND  $\beta$  GENES IN SHORT SEGMENT (6000 NUCLEOTIDE PAIRS) OF HUMAN GENOME

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 285, No 6, Dec 85  
(manuscript received 18 Nov 85) pp 1487-1490

[Article by S. A. Nedospasol, A. N. Shakhov, R. L. Turetskaya, V. A. Mett, G. P. Georgiyev, corresponding member, USSR Academy of Sciences, V. N. Dobrynin and V. G. Korobko, Institute of Molecular Biology, USSR Academy of Sciences; Institute of Bioorganic Chemistry imeni M. M. Shemyakin, USSR Academy of Sciences, Moscow]

[Abstract] Tumor necrosis factors are polypeptides secreted by stimulated macrophages and T-lymphocytes, having cytotoxic or cytostatic effect on a broad range of tumor cell lines. The authors undertook molecular cloning of a human  $\alpha$  (macrophage-stimulated) TNF gene and studied the adjacent area of the genome. A  $\beta$  (T-lymphocyte stimulated) TNF gene was found in the immediate vicinity in the direction opposite to the direction of transcription. It was thus established that a human genome DNA fragment only 6000 nucleotide pairs in length contained sequences coding both TNF proteins. The tandem organization of the two TNF genes indicates that at least one level of control of expression is effective for both genes using a common regulatory mechanism. References 14: 2 Russian, 12 Western.

6508/9835  
CSO: 1840/292

UDC: 577.152.361.3:577.112.5

NUCLEOTIDE SEQUENCE OF cDNA AND PRIMARY STRUCTURE OF  $\alpha$  SUBUNIT OF  $\text{Na}^+$ ,  $\text{K}^+$ -ATPase IN PIG KIDNEYS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 285, No 6, Dec 85  
(manuscript received 16 Sep 85) pp 1490-1495

[Article by Yu. A. Ovchinnikov, academician, S. G. Arsenyan, N. Ye. Broude, K. Ye. Petrikhin, A. V. Grishin, N. A. Aldanova, N. M. Arzamazova, Ye. A. Aristarkhova, A. M. Melkov, Yu. V. Smirnov, S. O. Guryev, G. S. Monastyrskaya and N. N. Modyanov, Institute of Bioorganic Chemistry imeni M. M. Shemyakin, USSR Academy of Sciences, Moscow]

[Abstract] In order to discover the molecular basis of functioning of  $\text{Na}^+$ ,  $\text{K}^+$ -ATPase, the authors have studied the structural organization of the molecule of the enzyme, giving particular attention to analysis of the primary structure of its subunits. In this report the nucleotide sequence of cDNA corresponding to the translated area of mRNA is presented, along with the primary structure of the catalytic  $\alpha$  subunit of  $\text{Na}^+$ ,  $\text{K}^+$  ATPase from the pig

kidney. Previous reports have presented the amino acid sequence of the central portion of the polypeptide chain of the protein. The results of the work on establishment of the primary structure of glycosylated  $\beta$  subunit in combination with further analysis of the topography of the catalytic  $\alpha$  subunit, completed with this article, will serve as a basis for creation of a more detailed model of the three-dimensional organization of the  $\text{Na}^+$ ,  $\text{K}^+$  ATPase molecule. References 15: 5 Russian, 10 Western.

6508/9835  
CSO: 1840/292

## NONIONIZING ELECTROMAGNETIC RADIATION EFFECTS

UDC 633.1:577.15.087.5:58.037

### ACTIVITY OF OXIDATION-REDUCTION ENZYMES IN GRAIN SPROUTS AS BIOCHEMICAL TEST FOR PREPLANTING SEED TREATMENT IN ELECTRIC FIELD OF CORONA DISCHARGE

Moscow SELSKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian No 6, Jun 85  
(manuscript received 25 Oct 84) pp 83-85

[Article by A. A. Anisimov, V. S. Goldayev, L. N. Kurganova and  
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[Abstract] The purpose of this work was to determine the influence of treating grain crop seeds with the electric field of a corona discharge under various conditions on the activity of certain oxidation-reduction enzymes in the sprouts developing from the treated seeds. The activity of oxidoreductases can be considered one possible test of biochemical changes occurring in seeds as a result of electric field treatment. Sprouts of wheat, barley and oats were studied after treatment by corona discharge. Treatment of the seeds results in 1.5 to 3 fold increase in oxidation enzyme activity in the sprouts grown from the seeds, probably a result of the change in the degree of polarization of cell membranes, rate of movement of charges in the cytoplasm and orientation of molecules with constant dipole moment. References 11: 10 Russian, 1 Western.

6508/9835  
CSO: 1840/1022

HISTORY, PROSPECTS OF PHARMACOETHOLOGY

Moscow USPEKHI SOVREMENNOY BIOLOGII in Russian Vol 99, No 3, May-Jun 85  
pp 463-478

[Article by V. P. Poshivalov, Leningrad Medical Institute No 1 imeni Academician I. P. Pavlov, USSR Ministry of Health: "Pharmacoethology"]

[Text] Pharmacoethology studies the nature and mechanisms of action of psychotropic agents on the intraspecies behavior of animals under natural or laboratory conditions. The article examines methodical, methodological, and applied aspects of studying intraspecies behavior, and methods of regulating it. It proves that the grouping of animals and various forms of intraspecies communication substantially influence the basic effects of psychotropic agents (psychostimulants, tranquilizers, anti-aggressive agents, and others). It analyzes the participation of neuromediator and peptidergic systems of the brain in regulating intraspecies behavior. It emphasizes that methods of reversible and directed pharmacological action on animals are advantageous for analyzing mechanisms of complex forms of intraspecies behavior--aggression, defense, sociability, and so forth.

Introduction

In recent years, based on the synthesis of two sciences--experimental psychopharmacology and ethology--a new scientific direction has been formed, acquiring the name pharmacoethology (or ethological pharmacology). In its broadest form, pharmacoethology examines the nature and mechanisms of action of psychotropic agents on the intraspecies behavior of animals under natural or laboratory conditions. The nature of action of pharmacological substances on behavior can be studied both on the level of the organism and the population. The concept of "population" is fairly broad in its meaning. In most pharmacoethological experiments the idea is the effect of substances on the structure of limited intrapopulation grouping and on the behavior of interacting individuals of a single species. It should be noted that the object of study and analysis is not the individual actions of animals in and of themselves, but the complete, goal-oriented behavioral acts which have definite biological meaning. These acts and postures are systematized and combined into definite functional categories which correspond to the context of intraspecies inter-

action. Most frequently functional classifications of acts are constructed (9, 22, 40, 44, 49) according to motivational signs: behavior of aggression, defense, sexual behavior, mothering behavior, ambivalent behavior, and so forth.

With regard to questions of substance influence on intraspecies behavior, special attention is focused on the fact that the effect of many types of psychotropic agents currently cannot be adequately evaluated outside of the connection with behavioral elements of interaction and intraspecies relations (the simple screening tests done in pharmacology did not previously take into account this possibility of assessment). It is methodologically and logically worthwhile to undertake this expansion and complication of pharmacological experiments, since it makes it possible to reveal properties of substances which are in principle impossible to discern by other methods: for example, the effect on the overall nature of behavior, behavior program, and ethological structure of the population and group. The necessity of developing pharmacoethology comes out of the further progress and evolution of experimental methods of studying the properties of pharmacological substances in order to characterize them as fully as possible at a pre-clinical level of study.

It should be noted that certain psychotropic agents (for example, tranquilizers) are rarely used in practice to correct behavior arising as a result of conflicting stress-distress situations, which are frequently caused by complex interactions between individuals. This stimulates experimental study in the field of modeling intraspecies conflict situations in animals at various degrees of evolutionary development. It is especially necessary to develop models of pathological intraspecies behavior (7, 9). But this problem is currently only in its infancy both on the theoretical and the experimental plane.

Applied research in a pharmacoethological direction is being carried out on various animals: fish (67), insects (114), birds (54, 55), rodents (22, 92, 104, 83, 85, 77), cats (6, 12), and primates (51). Laboratory rodents are predominantly used as the object of study in experimental psychopharmacology.

#### Formulating Tasks in the Field of Pharmacoethology

In modern pharmacoethology, two basic directions of research should be defined, two dialectically connected views of the problem: (1) the study of how pharmacological substances affect various forms of intraspecies behavior, communicational ties, and interindividual relationships, and (2) the study of how intraspecies variables influence the known effects of pharmacological substances.

The first direction addresses the following basic questions: (1) what constitutes the immediate effects of pharmacological substances on the structure of behavior (one individual or several) in interaction in groups of animals with various qualitative and quantitative compositions (age, gender, position in the hierarchy, and so forth), the type of interrelations (conflict, nonconflict, approach, flight, and so forth), and also in their hierarchy or territorial relationships; (2) what constitutes the chronic (long-term) effect in the same situations; (3) how do rules of animal interaction change under the

influence of the substances, and what constitutes the mechanisms of pharmacological influence on intraspecies behavior at the population (superorganism) level and at the level of an individual taken separately (engaged in interaction); (4) what happens with specific species-typical process of animal communication (audible, olfactory, tactile, visual); (5) how do substances change the biochemical and physiological states of animals and how has this a causal effect (specifically or nonspecifically) on intraspecies behavior. The basic questions of the second direction are these: (1) what constitutes the effect of grouping on the specific psychotropic action of substances (antiaggressive substances, tranquilizers, and antidepressant substances) during acute and chronic application; (2) how (quantitatively or qualitatively) are intraspecies factors able to change the effect of substances; (3) in which direction the toxic effects of substances are changed under the influence of grouping factors (for example, minimum effective doses, average lethal doses, maximum lethal doses); (4) are there status-dependent (dominance-submission) influences on the effects of substances; (5) what are the laws and mechanisms by which intraspecies factors (as an external element with regard to a single individual, as part of the environment) determine the biochemical and physiological state of the individual and how does this influence the effects of substances in the final analysis.

Pharmacoethology is based on the methodological approaches of behavioral biology and is connected to a significant degree with its development (66, 72, 108, 109). A great contribution was made to the development of ethology in this country by the work of L. V. Krushinskiy and his school, in particular his work "Formirovaniye povedeniya zhivotnykh v norme i patologii" [Formation of Normal and Pathological Animal Behavior]--the conception of unitary behavior reactions, the theory of goal-oriented ("rational") extrapolation reactions. The intensification of natural science's formulations of questions of regulating intraspecies behavior gave the primary impetus to the All-Union Conference "Controlling Animal Behavior" (1977), and also the work of the ethology sections of the All-Union Theriological Society, held within the framework of the society's Third Congress (Moscow, 1982) (2, 15, 19, 37, 42, 43, 46, 48, 71).

For long years, the naturalistic approach predominated in most works devoted to studying and analyzing the free behavior of animals, which produced mainly descriptive, qualitative characterizations of behavioral acts. But with the development of new principles and methods of analyzing behavior based on recording (samples) of behavior, and their formalization in the forms of symbols, codes, and so forth (28, 34, 49, 50, 79), the possibilities of precise description of free behavior substantially expanded. Ethological pharmacology in recent years has acquired a computerized nature. New systems of recording behavior have been created: Etograf, YeS 1022 Etograf-Computer, Elektronika DZ-28 Etograf-Display Computer (34, 93, 95, 98), and programs have been developed for processing data using the mathematical apparatus of the theory of probability, and matrix methods of analysis. This has made it possible to precisely characterize the stationary and nonstationary phases of behavior, get an idea of the behavior program of animals at any moment in time based on the configuration of a discrete and discontinuous model of intraspecies behavior, and use these models in experimental psychopharmacology (98).

Special matrices for recording group behavior were developed for generalized characterization of the behavior of a group of animals and the effects of psychotropic agents on behavior under these conditions (29, 92).

#### Influence of Intraspecies Factors on the Effects of Psychotropic Agents

This question must be examined from at least two perspectives: (1) what are the quantitative intraspecies variables (for example, number of individuals in the group), and what mechanisms are able to influence the effects of the substances; (2) what are the qualitative intraspecies variables (age and gender composition of the group, rank distinctions, and so forth), and how the effects of psychotropic agents can change. It should be made clear that each specific group of psychotropic substances has a definite spectrum of action characteristic only to it, so during analysis it is important to be precise about exactly which effects of the substances (antiaggressive agents, tranquilizers, psychostimulants, and so forth) change under the influence of intraspecies (group) factors, how the ratios of dose and effect change, and average effective and toxic doses.

Quantitative variables. One of the first experimentally established factors of influence by the number of individuals present on the effect of a substance was what is known as the effect of group toxicity of phenamine (59). It was shown that the toxic effect of the psychostimulant phenamine is manifested largely in animals in a group. Various arguments were advanced to explain this phenomenon. It was suggested (73) that among mice in a group the production of heat increases, and this affects the toxicity, indeed raising the temperature itself increased the toxicity of phenamine and heightened group toxicity, while in the cold the toxic effect was manifested to a lesser degree (75). Chance (59), for example, thought that it was the behavioral phenomenon of huddling together (aggregation) which was the main factor affecting the toxicity of phenamine. Then group toxicity was discovered for reserpine introduced after nialamide or pargiline, for morphine, picrotoxin, caffeine, and others.

In experiments carried out in the 1960s to study the group toxicity of phenamine, detailed behavioral analysis was not carried out, so it is fairly difficult to judge which factors--specific group factors (communication, and so forth) or nonspecific factors (for example, physical changes in the environment)--determine the occurrence of this phenomenon. The effect of the group was examined as a general phenomenon, without precision with regard to processes occurring within the group, and a very gross assessment of the final results. Despite the uncertainty of the mechanisms of its occurrence, the phenomenon of group toxicity of phenamine was easily reproducible, and it was widely used as a screening test for preliminary study for potential neuroleptics.

It must be taken into account that the nature of the influence of the group is not necessarily identical whether the substances are given to all animals or only to a few. Intraspecies behavior is intradependent, and animals under the influence of the substances can have particular influence on the others which have not been subjected to the pharmacological influence. For example, it has been shown (85, 92), that mice which have received ethanol, phenamine, and

other drugs can change the behavior of undrugged individuals. In a group of rats, scopolamine (1 mg/kg of body weight), as a rule, increases the number of intraspecies contacts. If there are animals in the group which have not received the drug, the effect of the scopolamine is reduced (105). Untreated rats react with extraordinary aggression to a rat which has received mescaline, but not to untreated rats when they interact with them in pairs (in a situation with electric shocks delivered on an electrode field) (101).

How did the conditions of grouping influence the nature of psychotropic effects of substances, and what objectively recorded changes can help to explain this phenomenon? It is known that the grouping process of animals leads to precisely recordable changes in metabolism in the central nervous system and other organs and tissues. But for some animals, the basal metabolism in the group increases, and for others it decreases. The reasons for this have been analyzed in detail. For example, Slonim (40, 41) proved experimentally that for animals which ordinarily have a solitary way of life (using predominantly territorial behavior), gas exchange increases during grouping, and for animals which form colonies or are gregarious, grouping reduces gas exchange. The reduction of exchange in the group, as a rule, is connected with a change in thermoregulation, the periodicity of sleep, and reduction of agonistic tendencies in behavior. Thus, grouping directly affects the physiological and biochemical state of individuals, which substantially changes the conditions under which the psychotropic agents are operating, as well as the nature of the psychotropic effect (9).

According to modern conceptions (16, 17), the outside environment in which the animals exist can be regarded from an informational perspective as an informational biological field which presents an entire array of species-typical signals which influence the animal. The actual influence may be not only stimuli arising as a result of animal contacts, but also traces of the presence of other individuals. Without direct physical contact information can still be transmitted which can change the behavior and a number of physiological functions (hormonal, and so forth) of a single individual (11, 42, 43). Several ways of transmitting species-typical signals are known: olfactory (chemocommunication), auditory and ultrasonic (acoustic), visual, and tactile means.

Chemocommunication is carried out using chemical substances (pheromones) which can be signaling ones, rapidly and directly influencing the behavior of the animal receiving them--or initiating them--provoking the initiation of certain types of hormonal activity and directly influencing behavior. Olfactory signals can have a real influence on the effects of pharmacological substances. As an example, one may cite data (106) which proves that if females are placed on bedding which has a male's scent, then their hexenal sleep is prolonged (analogous data have been obtained when females and males are kept together).

It is well-known that chemical signals have such a powerful biological effect that they can cause blocking of pregnancy (58), false pregnancy (112), or synchronization of the estrous cycle in mice (115). Pheromones can cause alarm in animals, provoking fright and aggression (42). It is natural to expect that under conditions of group interaction a change in the pheromonal properties of animals (urine, excrement, and so forth) might determine the final outcome of the psychotropic effect.

The capacity for species-typical auditory communication (it can be changed under the influence of substances) is undeniable; it is necessary for adequate behavioral interaction of animals in a group. Of particular importance in analyzing and correctly understanding the changes occurring in the behavior of rodents is the ultrasonic (US) range (inaudible to the human ear, but a property of many rodents, on which most pharmacological experiments are carried out). For example, in a situation of agonistic interaction of two males, the subordinate one, as a rule, gives off a US-signal which stops the attack of the aggressor (81). If the ability to emit US-signals is pharmacologically blocked while the motor activity of the subordinate individual is increased (for example, by diazepam), the number of attacks on this animal can increase (85, 92).

Substances can have different effects on the auditory and ultrasonic communication of rats. For example, phenamine and cocaine do not change the frequency of rats' squeaks in the auditory range, but they substantially reduce vocalization in the US-range (20-27 kHz) in a situation of agonistic interaction of animals.

In recent years, experimental psychopharmacology has successfully been using the US-vocalization of young during their removal from the mother for testing the stress-protective effect of a substance. The model of distress-vocalization of young has proved the effectiveness of agonists of opiate receptors in suppressing the ability of antagonists (naloxone) to increase distress (89, 90). For testing analgesics, a model of the pain vocalization of rats in the presence of another individual can successfully be used. In the presence of a partner, the nature of the vocalization of rats experiencing pain changes-- instead of the usual broad-band signals, rats at threshold intensities of stimulation give off a hissing sound in the presence of a partner, and at high thresholds--US-signals (53). A squeak of pain and pain behavior of another individual (as a set of communication signals) can be used to produce a conditioned flight reaction in untreated animals (37-39). As a pharmacological test, this flight reaction has been successfully used on rodents to study the psychotropic properties of various classes of pharmacological substances (35).

The visual communication channel is significant in perceiving ethological information in the form of specific acts and postures with a concrete intra-species meaning. An animal's perception of one posture or another can promote or inhibit the development of corresponding behavioral reactions in the recipient (aggressive, defense, sexual, and other reactions). Psychotropic agents which change the ability of visual perception (for example, cholinolytic drugs) can nonspecifically influence various forms of intraspecies behavior.

Intraspecies communication signals can play the role of a nonspecific exciting factor, and in this case these activating signals can reduce the depressing effects of psychodepressants, for example diazepam, and enhance the activating effects of psychostimulants, for example phenamine (9, 55, 85).

Specific signals (scent signals, acoustic signals) can precede concrete ethological manifestations of intraspecies interaction, accompany them, or follow them. It should be kept in mind that under natural conditions animals deal most frequently not with isolated but combined signals, the significance of

which often depends on the context of behavior, on the simultaneous combination with other signals, other modality, and other channels of information. Depending on the situation, one and the same isolated signal can have a different significance and function. This is one of the objective difficulties in constructing the function between signal and substance effect, as well as between signal and the change in the physiological state of the animal which receives it. A more simply analyzed situation is the relationship between drug action and the changed physiological state of the recipient, and between drug action and the changed effect of the substance, particularly in situations of intraspecies competitive relationships, fights, and so forth. Serious consequences of agonistic interaction between animals are noted not only for the object of attack (the defending animal), but also for the aggressor (56); there is a state of emotional strain and stress with all the characteristic manifestations--neuromediator, hormonal, vegetative, somatic, and other manifestations (76, 80).

Apart from specific signals and actions there is a large group of nonspecific factors which are also connected with grouping and represent the consequences of grouping. This is caused by a group of changes in the physical parameters of the environment (temperature, moisture and others). It is known that increasing the temperature in a group up to a certain level leads to increased aggression, and with progressive action of the temperature factor to reduced intragroup aggression. Increased moisture has a breaking effect on various forms of intraspecies behavior, including aggressive behavior (70).

Under the influence of psychotropic agents, animals' sensitivity to the action of intragroup stimuli can change (74, 116). For example, rats which received iproniazid were more susceptible to the influence of the group than animals which received aminazine or a physiological solution. Disruptions of intra-group stability occur not only when an outside animal is introduced into the group but also when one of the members of a stable group is removed. When an animal is removed from the group, the activity of the remaining animals increases proportionally to the number of members. The activity of the outside animal in the group is initially low, as a rule, and does not depend on the number of members in the group (1). Giving thalidomide to all members of the group inverts the usual reaction of animals to an outside animal (116).

The influence of the group on an individual member largely depends on the size of the group. With increased numbers in the group, intraspecies contacts are reinforced (the probability of contacts in a limited territory increases) and the influence of members of the community on each other increases. Within a population, increased numbers cause "social pressure" to increase (61, 62), which is manifested in the form of competitive behavioral interactions, which have a pathological effect primarily on a significant proportion of subordinate animals. "Social pressure" is believed to play a basic role in the subsequent fate of the population, but many investigators have differing points of view on this account (16, 46, 60, 80). There are widely acknowledged concepts of the regulation of numbers and intraspecies relations for long periods of time through a neuroendocrine system with disruption of general mechanisms of adaptation. Naturally, under such conditions, the sensitivity to psychotropic agents and the nature of their effect substantially changes (7, 9).

Summarizing data on the group's influence on the effect of pharmacological agents, it should be noted that on the whole, in the group the depressive (sedative) effects of psychodepressants are manifested to a lesser degree, while the activating influence of psychostimulants is realized to a greater degree than for solitary animals.

Qualitative variables. Differences in qualitative composition of groups of animals include age, gender, linear, and certain other differences. Special attention is accorded to factors in psychopharmacology which are frequently uncontrollable, such as rank and hierarchical factors. The differences between dominant and subordinate individuals according to an entire array of indicators (behavioral, neurochemical, biochemical, hormonal, and somatic indicators) are fairly substantial. The presence of contrasts in many indicators gives us grounds for thinking that the effect of psychotropic agents for dominant and subordinate individuals should be different (9). It should be noted that dominant individuals can be fairly easily and quickly distinguished in the group, but with regard to subordinate individuals not everything is yet clear. It has been shown (7, 9, 18, 46, 92) that there is more than one kind of group of subordinate animals: there are animals which are pursued by the dominant individual to a greater degree (more stressed), while others successfully avoid encounters with the dominant individual. In groups with a partial structure of hierarchy, there is always a category of animals which are nonaggressive but in certain circumstances can still occupy dominant positions. Clearly there is a biological demand for the existence of such individuals. For example, it is observed that in a high density of population highly aggressive types have superior chances for survival and reproduction, while less aggressive but more fertile types of animals flourish during periods of low density (113). These situations must be taken into account when solving problems of regulating numbers using pharmacological agents.

Taking into account the phase of interrelations between animals in a group is very significant. In a phase of established relations, the values of indicators can be contrasted, while during the period of initial establishing of a hierarchy distinctions might not be observed, since all fighting animals are stressed. The effect of aggressive interaction on adrenocortical functions of animals largely depends on relative strengths and the outcome of encounters. For example, experiment has shown (57) that 1 hour after grouping the animals into fours the amount of corticosterone in the plasma of mice increases, while the amount of circulating gonadotropins (follicle-stimulating and luteinizing hormones) decreases. Concentrations of corticosterone under these conditions return to the original level in dominant animals after 1-3 days, while for subordinate individuals this occurs only after 3-6 days. This proves that dominant animals have more rapid adaptation capacities, while for subordinate ones the stress is prolonged. It is observed that low-ranking individuals stressed in artificial ("super populations") are sharply distinguished from high-ranking ones, and have increased activity of tyrosine hydroxylase in the brain and phenylethanolaminemethyl transferase in the adrenal glands (88). The activity and metabolism rate of catecholamines in low-ranking animals is higher than in unstressed individuals (dominance).

All the data presented demonstrate the temporary or lasting differences in the characteristics of dominant and subordinate individuals, but they do not show the reasons why some animals become dominant and others do not, or why there are differences in resistance to stress. In order to win a high rank and establish certain dominant-subordinate relationships, animals must have a fully defined selection of properties (aggressiveness, competitiveness), but maintaining them requires other properties, and for this high energy expenditures, high aggressiveness, and so forth, are no longer necessary (92). A number of individual properties of the central nervous system are important for realizing the capacity of a potential dominant. For example, in groups of mice individuals with a strong motor type of nervous system become dominant (46, 47). In the process of grouping during formation of the hierarchy these animals were less stressed (46). The impression is created that many properties of dominant animals can be genetically reinforced and inherited. But this problem is so complex that only a comprehensive interdisciplinary approach will be able in some degree to give a definite answer with regard to mechanisms of establishing dominant or subordinate types of behavior, and the role of innate and acquired properties in producing one type of behavior or another.

Pharmacological treatment of subordinate individuals only in evaluating the effect at the group level (9, 51, 64, 92) does not lead to any substantial changes of their position in the hierarchy if its structure has already been established. In these cases the changes in behavior can be regarded as more quantitative than qualitative (92). Pharmacological treatment of dominant individuals only is decisive (51, 92) for the subsequent fate of dominant-subordinate relations in groups of animals. But the effect of intraspecies status on the nature of the psychotropic (behavioral) effect has been little analyzed, and in psychopharmacology represents a frequently uncontrollable source of variability of results. The intraspecies hierarchical status of animals can be correlated with their behavioral response to certain pharmacological agents. For example, in rhesus monkeys the effect of diazepam varied in accordance with the position of the animal in the hierarchy (5). It can also happen that the hierarchical position of an animal does not change, but subordinate animals show greater shifts in their sleep-waking, locomotion, and grooming cycles than dominants.

In experiments with other substances, for example  $\Delta$ -9-tetrahydrocannabinol (THC), the drug affected the behavior of dominants to a greater degree than that of subordinates (100). Cannabis in a dose of 100 mg/kg caused in Papio papio monkeys for the first 3 days after treatment a temporary depression of dominant behavior and a reciprocal growth of activity for subordinate individuals (71). But, starting from the fourth or sixth day, dominant behavior in individuals of the first rank increased and intraspecies aggression developed progressively. In mice, cannabis (23 mg/kg per day) caused no qualitative changes in the structure of the hierarchy, but reduced individual activity in dominants patrolling the territory, and slightly affected locomotion in subordinate individuals (65). Canceling the drug increased the aggression of dominant individuals and caused no significant changes in the intraspecies activity of subordinate individuals. It should be emphasized that recognizing changes in the behavior of subordinate individuals in pharmacological experiments is frequently made more complicated because they demonstrate overall depression of behavior, and in this case the action of the psychodepressants is not easy to distinguish.

Dominant and subordinate individuals are not identically sensitive to ethanol, nor are the dynamics of development of dependence on it identical for them. Dominant individuals receiving ethanol became more despotic, while for subordinate individuals ethanol increased defensive reactions (64). Many researchers believe that ethanol increases the same type of behavior which has already been stimulated by the context of the test situation itself. But it is noted (84) that ethanol (0.5 g/kg) affects the aggression of dominant animals to a greater degree than the defense behavior of subordinates. Chlorodiazepoxide further increases attacks in dominants (84). THC has a specific antiaggressive effect on dominance, while for subordinates it distinctly depresses defensive reactions.

In our experiments (92), phenamine had a different effect on dominants and subordinates in linear triads. The drug increased aggression with regard to a subordinate animal, but in a dose of 1 mg/kg it did not cause inversion of the dominant-subordinate relationships. Similar data were obtained for rhesus monkeys (52). Clearly, the actual effect of substances on behavior depends on the experience of intraspecies relationships and on the subject's position in the group. This acute effect of phenamine does not influence the position of a dominant animal in the hierarchy, but chronic use of the drug on individual members of a group of rhesus monkeys results in changing their positions in the hierarchy (110).

Thus, natural differentiation of individuals leads to polarization of groups into dominant and subordinate individuals with various degrees of stress, and qualitative physiological and other types of nonuniformity of the animals, which determines the differences in effects of psychotropic agents. Primarily these differences relate to sensitivity to specific effects of psychotropic agents in dominants and subordinates, to differences in average effective doses for activation or suppression of certain forms of intraspecies behavior (7).

It should be emphasized that the qualitative composition of the group, the position of an animal in the hierarchy, and the type of hierarchy must be taken into account in posing problems of pharmacological control of the behavior of the group as a whole. The nature of antiaggressive, tranquilizing, and psychostimulating effects is manifested in various ways under conditions of groupings of animals and is reflected in the final evaluation of the action of substances at the group level (population).

#### Effect of Pharmacological Substances on Intraspecies Behavior

Studying the effect of pharmacological agents on intraspecies behavior and mechanisms of this action is done from several perspectives and in various methodological situations. The most typical three versions of interaction are as follows: (1) two animals (diads); (2) several animals in a group (triads, tetrads, and larger); (3) in large populations.

The most convenient and simplest situation for laboratory psychopharmacological research is diad interactions (41, 107, 108). Under these conditions scientists study the pharmacological spectra of action of basic prototypes of psychotropic agents, the participation of neuromediator systems in regulating

intraspecies behavior using neuropharmacological agents, and the influence of peptides and hormones (and also mechanisms of this influence) on intraspecies behavior (1, 3, 22, 24, 84, 93, 104).

In the 1960s and 1970s, under the leadership of A. V. Valdman, our laboratory analyzed the pharmacoethological spectra of action of basic (standard) representatives of various classes of psychotropic agents (9, 21, 22, 24) on the example of the behavior of aggressive isolated males and other models. The pharmacoethological spectra discovered and formalized for neuroleptics (derivatives of phenothiazine and butyrophenone), tranquilizers (benzodiazepines and analogs of gamma-aminobutyric acid [GABA]), psychostimulants (phenylalkylamines), and analgesics (morphine-like compounds) reflect the selections of properties which are characteristic for each specific group (5, 8, 95). The spectra obtained have substantial differences, and they may be used as referents in studying the ability of chemical compounds to change the structure of motivational forms of intraspecies behavior (aggression, defense, sociability, ambivalence, and so forth). Based on comparative analysis of the spectra, we identified the tranquilizing and antiaggressive properties of compound BD-634, and the tranquilizing-sedative properties of mebicar and phenibut (7, 9).

Ethological analysis of the action of catecholaminergic substances has shown that the results of intraspecies aggression of isolated individuals depends on the level of activation of noradrenergic and dopaminergic systems (95). Agonists of noradrenergic and dopaminergic receptors (cocaine, phenamine, apomorphine) in small doses promote aggression and reduce other forms of intraspecies behavior (30). High doses of agonists and the catecholamine precursor Z-DOPA in a dose of 200 mg/kg causes inversion of aggression into defense, which is abnormal and eccentric, and locomotor stereotypes appear. The use of inhibitors of dopamine- $\beta$ -hydroxylase, in particular analogs of fusaric acid FD-008 and disulfiram, in doses of 100 mg/kg lead to reduced aggression in isolated individuals with various degrees of selectivity of the effect. Taking into account the effect that FD-008 selectively reduces the level of noradrenaline in the brain, it might be suggested that strengthening of the noradrenergic medication is more responsible for maintaining intraspecies aggression than that of the dopaminergic (95). Nizoxetin--an inhibitor of reverse capture of noradrenaline--increases species-typical aggression and reduces sociability.

Adrenoblockers (phentolamine, propranolol) reduce nonspecific hyperactivity and suppress aggression, but do not cause specific renewal of intraspecies sociability. Intraspecies contacts in mice on a background of adrenoblockers (and also the dopaminolytic haloperidol) are of a passively reacting nature (32, 84, 95).

The increased level of serotonin in the brain when 5-hydroxytryptophan and Z-tryptophan (50 mg/kg) are used blocks aggression during increased hyperactivity of animals (32, 95). The increased level of serotonin with retarded reverse capture of serotonin by fluoxetine (10 mg/kg) temporarily and nonselectively reduces aggression and activates defensive behavior. Prolonged isolation of animals promotes reduction of the level (circulation) of serotonin (20, 111). Exacerbating the deficit of serotonin by using p-chlorophenylalanine (PCPA) in a dose of 70 mg/kg increases the frequency of attacks in isolated individuals after 24 hours, while a higher dose increases hyper-

activity, and causes the appearance of the behavioral stereotypical complex of aggression--homosexual behavior with reduced intraspecies sociability. The importance of maintaining a certain level of deficit of serotonin in order to obtain aggression follows from experiments of combined use of fluoxetine and PCPA (95). This combination reduces the probability of the appearance of aggression and PCPA-dependent sexual behavior. The reduced level of serotonin in the brain and activation of catecholaminergic systems are important factors not only in the occurrence of aggression, but also sexual behavior, reduced sociability, and activation of defense.

Blocking of cholinoreactive systems (scopolamine in a dose of 0.25 mg/kg) selectively depresses the aggression of animals and simultaneously increases their sociability, while the use of a cholinomimetic (physostigmine in a dose of 0.125 mg/kg) leads to increased aggression, suppressed sociability, and abrupt activation of ambivalent forms of behavior (7, 78, 117).

Recently, scientists have been intensively studying the role of GABAergic retarding systems in producing intraspecies aggression of males (8, 31, 99). Hyperactivity and high aggressiveness of isolated males is partially connected with the lack of the functions of the GABAergic systems, since antagonists of GABA (bikukullin, picrotoxin, and thiosemicarbazide in a dose of 1 mg/kg) can intensify aggression, increase irritability, and reduce sociability. Relative compensation for the lack of GABA by means of direct activation of receptors by muscimol (0.2-0.5 mg/kg) increases sociability and reduces the frequency of attacks, but does not suppress aggression completely. More selective compensation for the deficit of GABA is possible using inhibitors of degradation enzymes of GABA, for example, gamma-acetylene-GABA (GA-GABA) in doses of 50-1000 mg/kg (8, 95). Combined use of GA-GABA and the agonist of benzodiazepine receptors, diazepam, results in significant suppression of aggression, ambivalence, and great activation of sociability, which testifies to the importance of activating the benzodiazepine receptor complex to produce intraspecies sociability. Antagonists of benzodiazepines, for example certain  $\beta$ -carbolines (10), aggravate aggression and reduce sociability, and reduce the effect of diazepam on various forms of intraspecies behavior. A certain similarity between the behavioral effects of agonists and antagonists of GABA and benzodiazepine receptors leads to the conclusion that it is possible to achieve effects relating to the regulation of sociability and certain forms of aggression at the level of the GABA-benzodiazepine receptor complex.

Necessary elements of neuropharmacological treatment in order to have directed regulation of excessive aggressive behavior and a lack of sociability are as follows: reduced hypersensitivity of noradrenergic and dopaminergic receptor systems, increased serotonin-positive effects, reduced activity of cholinergic systems and (or) compensation for the lack of GABA and increased activity of the GABA-benzodiazepine complex. Comparison and analysis of the pharmacological spectra of action of peptides and neuropharmacological agents (32, 95-97) shows that activation of intraspecies sociability is possible not only using agonists of benzodiazepine receptors but also with an increased level of opiates (neoendorphin). The optimal effect in this regard can be achieved by combined use of neoendorphin and diazepam. Enhanced ethological manifestations of defense are possible not only with blocking of dopaminergic receptors but also in loading them with adrenocorticotrophic and  $\alpha$ -melanocyte-stimulating

hormones (96). Experiments have shown that synthetic peptides (hypothalamus-pituitary, opiate-like) can promote the development of many psychotropic effects: antiaggression (somatostatin, neoendorphin), aggression-causing (melanostatin thyroliberin), sedative, and so forth. Activation by peptides, in particular opiate-like peptides with shifted forms of activity, is one of the ways of realizing the stress-protective action of peptides in intraspecies conflicts. The high activity of opiate-like peptides in regulating intra-species aggression and sociability testifies that these substances have a marked psychotropic effect which is of great significance not only for integrating a state of analgesia but also for controlling affective reactions, which make up part of the structure of intraspecies behavior (32, 96, 97).

Study of the effect of substances on group behavior from several individuals was initially carried out taking into account the generalized indicators on fairly simple models, and as a rule, was not analytic (102, 107). On laboratory rats, these experiments were carried out in an "open field" construction in which a group of mice or rats moved about freely; the motor activity and elementary contacts of the animals were recorded (24). After various intervals of time, the position of the animals was photographed: this made it possible to track the dynamics of change of the group behavior under the influence of substances. These conditions were used to examine typical representatives of the basic groups of psychotropic agents--aminazine, doperidol, morphine, syndocarb, and phenamine. Neuroleptics (doperidol, aminazine) caused a tendency in the animals to isolate themselves from other individuals; this isolation was, as a rule, of the immobile type. A similar effect was caused by perphenazine and oxyprotepin (107). (Similar data were obtained for neuroleptics on cats (6, 12). It was suggested (108) that neuroleptics, in particular aminazine, had a selective ability to reduce the intraspecies significance of outside stimuli. Naturally, the specificity of this effect for neuroleptics needs to be made more precise, since substances from other groups (diazepam, pentobarbital) in high doses can produce an analogous effect. It should be noted that drugs from the group of thymoleptics (amitryptyline, imipramin) even in relatively high doses do not cause an effect similar to that of neuroleptics--that is, dispersion of a passive-type group (24). Reduction of motor activity does not always correlate with reduction of specific intraspecies sociability. Morphine caused a completely different type of group dispersion in laboratory mice: an active type of dispersion appeared, phenomenonologically similar to the effect of phenamine (102).

In groups of rats, phenamine in a dose of 1 mg/kg increased locomotion without reducing intraspecies interaction (sniffing, grooming), and in a dose of 3 mg/kg caused reduction of interaction and increased motor activity--that is, overall active-type group dispersion (102). Similar effects are characteristic for high doses of syndocarb (24), which suppress intraspecies activity while increasing individual forms of behavior. But in a dose of 5 mg/kg, syndocarb accelerates aggregation and improves the contact rate of animals. Clearly, in this range of doses the drug improves animals' ability to maintain associations connected with intraspecies interaction.

The phenomenon of aggregation unarguably contains organizing functions. It reflects animals' need for contact with peers. Despite the lack of opportunities for being in their own individual chambers, rats collect together, as a

rule, in one of the corners of the enclosure. The change which psychotropic agents cause to the nature of animals' aggregation testifies to the disruption of the elementary contact nature of the animals, their mutual attraction properties, and intraspecies sociability. It has been noted (103) that when hallucinogens are used the usual tendency to aggregate in mice disappears: the colony of mice seems dispersed, only a negligible number of the animals (approximately 2 percent) collect together into a pile, forming a pyramid.

Intraspecies relations and the effect of substances can have mutually caused effects on one another. For example, the relations of animals during a period of their injection with a narcotic analgesic (morphine) later affects the behavior of animals during the period of withdrawal--being located next to a particular peer can block or substantially reduce aggression during morphine withdrawal (86). The authors propose that intraspecies stimuli (associated with injections of morphine) themselves can later initiate the secretion of endogenous morphine-like substances (encephalins, endorphins), which can reduce withdrawal symptoms.

Assessing the effects of substances by a method known as socioactography (24, 102, 107) makes it possible only in generalized categories to judge animals' ability to have intraspecies contacts, ability to aggregate. This method is advantageous for preliminary assessment of substances and convenient in that it does not require special training of the experimenter. Among the methods' shortcomings, it must be mentioned that it does not have adequate resolution to judge the effect of drugs on the organizational structure of the group--that is, in principle it is useful only for testing nonconflicting groups. Modifications of this method have recently been successfully used for testing tranquilizers (68, 69). It should be kept in mind that testing of many psychotropic agents under conditions of nonconflict situations often fails to produce positive results: for example, tranquilizers and psychostimulators in experiments on chimpanzees did not change the hierarchical structure in the group, although intraspecies activity could depend on which drug the animals received--pemolin (a psychostimulator) or diazepam (a tranquilizer) (97). Consequently, in order to resolve problems of true pharmacological control of intraspecies behavior in groups with various hierarchical structures, it is necessary to develop models which include elements of conflict behavior.

Recently models and criteria of assessing the conflict behavior of groups of mice have been developed taking into account the hierarchical structure in the groups and separate assessment of the behavior of dominant and subordinate individuals--that is, individual characteristics of the behavior of the animals (4, 8, 9, 36, 92). It is known that in a limited territory the dominant-subordinate (DS) relationships in mice are established in a fairly short period (18, 63, 82, 91). Moreover, the DS-relationships initially form in a limited section, and then the mice can form their own sections of the territory (82). DS-relationships in mice in groups are a convenient subject for pharmacological experiments (64, 65, 92).

The question of the specificity of pharmacological action on DS-relationships in groups of animals should be made concrete, in our opinion, from two perspectives: what qualities and which specific animals (dominants or subordinates)

are critical during various periods of the formation of DS-relationships, and how do these qualities change under the influence of psychotropic agents (24, 92). It should be emphasized that when the effect of substances is evaluated at the group level (population level), their effect should be related not only to the intragroup status of an individual but also to the type of hierarchical organization. Results of experiments showed that in any type of intragroup organization in mice (despotic or partial), DS-relationships are determined by several factors, among which the most important in establishing the hierarchy is the ability to attack, aggression, and in maintaining the established relationships beyond that--the ability to patrol and intraspecies sociability (92). The special role of patrolling territory in mice in maintaining DS-relationships for a competitive environment was analyzed in detail. For example, Adams (49) regarded patrolling as an integral element of agonistic behavior of laboratory rodents.

In a specially constructed communication apparatus, DS-relationships were studied in groups of various numbers of mice (26, 29). It turned out that in small groups (from three to four mice) vicious and stable relationships of the despotic type form, while in larger groups (12 mice) less stable relationships with a partial hierarchy form. One-time injections of tranquilizer (diazepam), a neuroleptic (droperidol), and a psychodisleptic (mescaline) given to dominant individuals in groups with a despotic type of hierarchy caused no sharp changes in the DS-relationships due to the rigidity of these relationships, their inertia. DS-relationships also did not change when the drugs were used on subordinate animals. In addition, heightened aggression with small doses of phenamine in one of the subordinate animals, for example male  $\beta$ , in a transitory linear triad  $\alpha \rightarrow \beta \rightarrow \gamma$ , where each subsequent animal is subordinate to the preceding one, does not lead to a change in his hierarchical position, but only with regard to a greater number of attacks on him by the dominant (male  $\alpha$ ).

The cumulative psychotropic action of diazepam, droperidol or mescaline during long-term use of them causes inversion of the DS-relationships, moreover the speed of the inversion caused by the drugs depends not only on the specific properties of the drug itself but also on the conditions under which it operates (the type of hierarchical structure in the group) (92). In groups with a despotic type of organization the rate of DS-inversion under the influence of diazepam is slower than in one with a partial type--that is, one and the same action of the substance (suppression of aggression by diazepam) can in the final result have varying effects when assessed at the group level, though not for an individual taken separately. In these experiments it was shown that psychotropic agents of various groups can support the inertia of DS-relationships to differing degrees, and consequently caused their inversion. This capacity of substances is proposed for use as an integrative indicator of the selectivity of action of drugs on specific types of intraspecies behavior, in particular the intraspecies aggression of males (29, 92).

And so, pharmacoethology is a new and promising direction of research in the field of experimental psychopharmacology. The applied aspects of using pharmacoethological experiments have great economic significance and are not exhausted by solving the problems of medical science alone. Intensive development of pharmacoethology is necessary in order to resolve problems of controlling the behavior of animal populations, fight agricultural pests, control

numbers pharmacologically, and develop economically important species of animals. Pharmacoethology is developing successfully worldwide. Further widespread development of pharmacoethology will promote not only expanded research on pharmacological substances and development of experimental psychopharmacology, but also the study of mechanisms of intraspecies behavior and its directed regulation.

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12255

CSO: 1840/1007

UDC 616-001.28-06:616-001.17]-085.211:547.473.2]-099

TOXICITY AND ANESTHETIC EFFECT OF SODIUM HYDROXYBUTYRATE AND KETAMINE AT DIFFERENT PERIODS OF COMBINED RADIATION INJURY, BURN TRAUMA AND X-RAY EXPOSURE

Moscow FARMAKOLOGIYA I TOKSIKOLOGIYA in Russian Vol 48, No 6, Nov-Dec 85  
(manuscript received 10 May 84) pp 87-89

[Article by T. Yu. Ilyuchenok, B. K. Rasulev and L.A. Moiseyeva, Scientific Research Institute for Medical Radiology, USSR Academy of Sciences, Obninsk, Kaluga Oblast. Slantlines are used to indicate italics.]

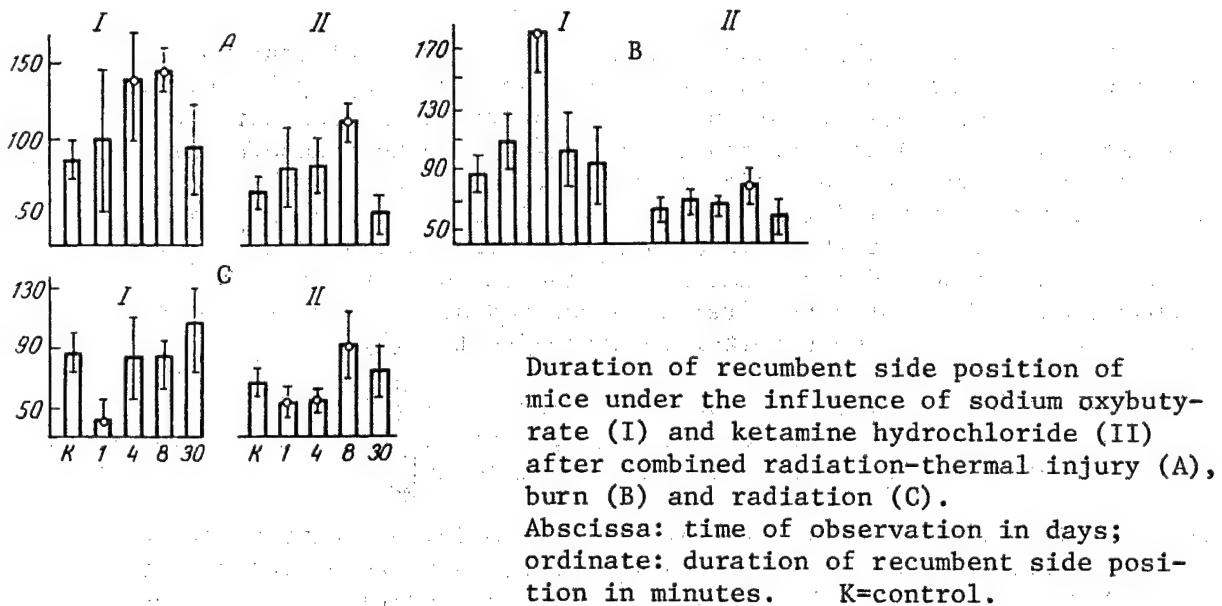
[Text] The reaction of the radiated organism to the administration of derivatives of barbituric acid (hexobarbital, sodium thiopental etc.) varies as a function of the severity of the radiation trauma and the duration of its development (3). A similar change in sensitivity to hexobarbital was also observed in combined radiation exposure (5, 6). This is the preferred drug among those used for intravenous anesthesia in combined radiation exposure (4); besides the barbituric-acid derivatives, propanidid (Sombrevin or Epontol), ketamine hydrochloride and sodium oxybutyrate are used. It was demonstrated that toxicity after combined radiation exposure is intensified in the case of a non-barbiturate drug--Epontol (5).

It was the goal of the study to investigate the sensitivity of animals under combined radiation exposure conditions, burn trauma alone and radiation alone to sodium oxybutyrate and ketamine hydrochloride.

/Methods of Investigation/ The sensitivity to sodium oxybutyrate and ketamine hydrochloride, subcutaneously administered, in tests of toxicity (LD<sub>50</sub>), efficacy (ED<sub>50</sub>) and extent (LD<sub>50</sub>/ED<sub>50</sub>) as well as duration of the anesthetic effect were determined in 1138 bastard mice, 18-22 g each in weight, after 24 hours and on days 4, 8 and 30 after burn trauma, radiation exposure and a combination of the two. IIIB-degree luminous burn (7.5 percent body surface) was sustained in the spinal region; in addition, 20.0<sup>±</sup>4.4 percent of the animals had died by day 30. A combination of the injurious factors (radiation and after 10-15 min burn) caused 84.2<sup>±</sup>2.5 percent of the animals to die. The antihypoxic activity of sodium oxybutyrate was rated by the degree to which the death of mice could be prevented in hypoxic hypoxia (rarefaction of the atmosphere). The drug was administered 30-40 minutes

after "uptake" in a pressure chamber to altitude 10,000 meters (198 mm Hg,  $pO_2$  141 mm Hg) at a velocity of 30 meters/second; the number of surviving animals was calculated after 15 minutes following attainment of the target altitude. In the control trials under these conditions all the mice died. On the basis of the dose series obtained for each effect of the drug, LD<sub>50</sub> and ED<sub>50</sub> were determined using the Litchfield and Wilcoxon method as modified by Roth. The statistical analysis of the other data was carried out using Student's  $t$  criteria; arithmetical averages and their confidence interval were calculated with  $P=0.05$  (1).

**/Results and Evaluation/** As can be seen from the table, the toxicity, ED<sub>50</sub> and extent of anesthetic activity of sodium oxybutyrate did not change substantially 24 hours, 4 days or 8 days after combined radiation-burn exposure, burn trauma and radiation.



Duration of recumbent side position of mice under the influence of sodium oxybutyrate (I) and ketamine hydrochloride (II) after combined radiation-thermal injury (A), burn (B) and radiation (C).  
Abscissa: time of observation in days;  
ordinate: duration of recumbent side position in minutes. K=control.

The recumbent side position was maintained in the case of sodium oxybutyrate administration at a dose of 1500 mg/kg for 4 days after burn trauma and under conditions of combined radiation-thermal injury for 4 and 8 days; in cases of isolated radiation injury, on the other hand, it was reduced more than half in the first 24 hours (see figure).

ED<sub>50</sub> of antihypoxic effect of sodium oxybutyrate (subcutaneous) in "uptake" to 10,000 meters altitude was  $59.6 \pm 6.5$  mg/kg; the entire group of intact mice died within 15 minutes. The sensitivity of mice in this trial 24 hours

after combined radiation-thermal injury was reduced to 1.5 times the previous value; the extent of the therapeutic activity did not change. On day 4 the sensitivity of the animals to the drug began to be restored and was restored by day 8.

Table I. Toxicity and Anesthetic Effect of Sodium Oxybutyrate and Ketamine Hydrochloride at Different Times after Various Types of Injury to Mice (M<sup>+</sup>m)

Type of Injury	LD <sub>50</sub> , mg/kg	ED <sub>50</sub> , mg/kg	Anesthetic Effect	
			(LD <sub>50</sub> /ED <sub>50</sub> )	
<u>Sodium Oxybutyrate</u>				
<u>Combined Radiation-Thermal</u>				
Intact animals				
24 ч (1)	3000±370 (15)	940±86 (35)		3,19
4 сутки (2)	3730±447 (25)	1190±104.3 (11)		3,13
8 "	2400±211 (25)	895±180 (10)		2,68
30 "	3360±653 (15)	940±95.6 (10)		3,57
<u>Burn</u>				
Intact animals	4250±581.8 (15)	940±86 (35)		4,52
24 ч (1)	3880±546.7 (10)	1100±150.9 (15)		3,53
4 сутки (2)	3830±327.3 (30)	1070±104.5 (15)		3,58
8 "	4320±385.7 (20)	1100±184.4 (10)		3,93
30 "	4500±257.8 (10)	1040±118.2 (30)		4,32
<u>Radiation</u>				
Intact animals	4250±581.8 (15)	940±86 (35)		4,52
24 ч (1)	4430±302.4 (9)	705±122.2 (20)		6,28
4 сутки (2)	3600±614.5 (15)	1100±150.9 (15)		3,27
8 "	5000±687 (20)	100±122.3 (21)		5,00
30 "	3460±293.3 (19)	896±128 (28)		3,86
<u>Ketamine Hydrochloride</u>				
<u>Combined Radiation-Thermal</u>				
Intact animals				
24 ч (1)	400±20,4 (30)	116±11,8 (40)		3,45
4 сутки (2)	400±18,9 (20)	55,6±10,9* (10)		7,19*
8 "	433±47,8 (17)	63±7,8* (10)		6,87*
30 "	355±18,2 (16)	86,8±21,8 (11)		4,08
	385±31,1 (10)	102±12,9 (10)		3,77
<u>Burn</u>				
24 ч (1)	410±13,5 (20)	89,5±18,1 (10)		4,58
4 сутки (2)	440±15,5 (21)	102±12,9 (10)		4,31
8 "	425±12,4 (10)	102±12,9 (10)		4,16
30 "	317±23,6* (15)	116±22,7 (20)		2,73
<u>Radiation</u>				
24 ч (1)	356±26,7 (15)	116±23,3 (10)		3,07
4 сутки (2)	374±12,4 (10)	102±12,9 (10)		3,66
8 "	425±45,3 (10)	61±26,6 (10)		6,96
30 "	317±23,6* (15)	89,5±18,1 (10)		3,54

Note. Asterix: Confidence for differences from control (intact animals), when P=0.05; in parentheses: number of animals. 1 =hours 2 =days

At all times, LD<sub>50</sub> of (subcutaneous) ketamine hydrochloride after burn trauma, radiation and combined radiation-thermal injury was close to the control value, nor did the toxicity situation differ from that of the intact animals. The exception was day 30 after isolated activity, when the toxicity of ketamine hydrochloride was intensified. ED<sub>50</sub> and extent of anesthetic effect of the drug in animals that had undergone burn and radiation traumas did not change. Only on day 8 after radiation was there a tendency for ED<sub>50</sub> to be reduced. After combined radiation-thermal injury the anesthetic effect of ketamine hydrochloride after 24 hours and on days 4 and 8 was increased to 2, 1.8 and 1.3 times the previous value respectively. ED<sub>50</sub> was 55.6±10.9, 63.0±7.8 and 86.8±1.8 mg/kg. The extent of the effect of the drug 24 hours and on day 4 after combined radiation-thermal trauma increased to almost twice the previous value (see table). The duration of the recumbent side position of the animals, caused by administration of ketamine hydrochloride (200 mg/kg), increased on day 8 after combined radiation-thermal injury, burn and radiation; at the early study times after radiation, on the other hand, it declined (see figure).

Thus, the change in the organism's reaction to the administration of the study drugs was a function of the stage and type of effect. The properties of the study drugs are also significant (2).

#### Conclusions

1. When sodium oxybutyrate and ketamine hydrochloride are administered, the organism reacts in dependence on the stage of injury and the type of effect.
2. Change of duration of anesthesia in the first days (1-4) after radiation contrast with those after combined radiation-thermal injury and after burn trauma alone.
3. The anesthetic effect of ketamine hydrochloride increases under conditions following combined radiation-thermal injury and does not change in isolated effects; its toxicity, on the other hand, increases on day 30 after burn and radiation alike.

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CSO: 1840/267

CENTRAL ACTION OF SNAKE VENOMS ON BODY TEMPERATURE OF RAT

Moscow FARMAKOLOGIYA I TOKSIKOLOGIYA in Russian Vol 48 No 6 Nov-Dec 85  
(manuscript received 18 Jul 84) pp 99-101

[Article by V.N. Gurin and V.V. Tsaryuk and A. Fitton, foreign research fellow from Great Britain, Chair of Normal Psychology (Professor V.N. Gurin, head) of Minsk Medical Institute. Slantlines show use of italics.]

[Text] Snake venoms have a broad spectrum of physiologic activity. There are numerous different studies devoted to their toxic and therapeutic effects (1,4 etc.). Yet their central effects have been insufficiently investigated. The majority of studies are concerned with changes in the bioelectric activity of the brain caused by venoms as their main subject (5). The central effect of venoms on indicators of heat exchange has not been investigated at all. Yet snake venoms are of great interest in this respect inasmuch as one component of them is phospholipase A, which hydrolyzes phospholipids, causing splitting off of fatty acid. As we know, some metabolism products of fatty acids, especially prostaglandins, act on thermal regulatory centers and cause hyperthermia (2,8).

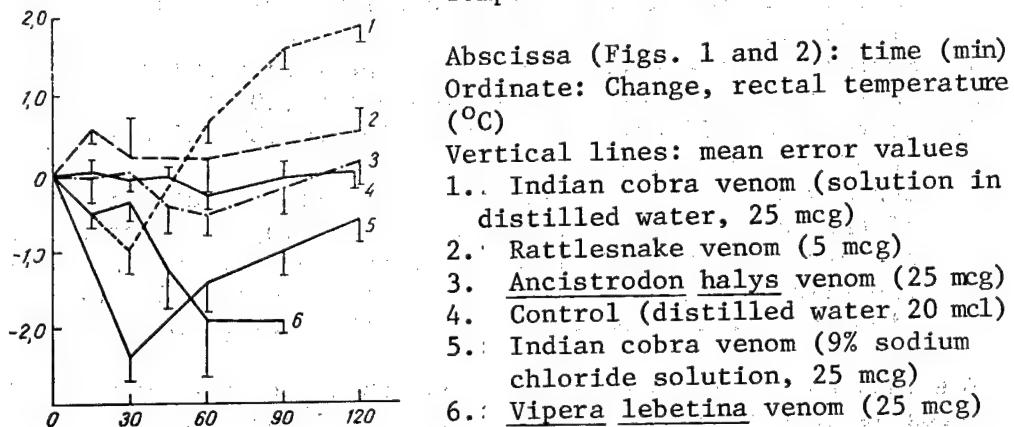
The purpose of this study was to investigate the effect of different snake venoms, injected into the ventricle of the brain, on body temperature and to study the possibility of altering the effect of venoms with substances that act on central thermoregulation mechanisms.

/Methods of Study/ Experiments were carried out in 93 male white rats, 160-180 g in weight each, at an indoor temperature of 19-21° C. Aqueous solutions of the substances were injected under local anesthetic (0.5 percent Novocain subcutaneously) into the right side ventricle of the brain. Microinjection was carried out using a special syringe and needle with a limited depth of penetration. The amount of fluid injected into the brain ventricles did not exceed 20 mcl. The substances were dried venoms of the Indian cobra Naja naja, the North American rattlesnake Crotalus adamanteus and the Central Asian vipers, Vipera lebetina and Ancistrodon halys. The injected dose was 25 mcg per animal. Injections of the protein synthesis inhibitors anisomycin and cycloheximide and of the prostaglandin synthesis inhibitor valtoren were carried out 30 minutes before the injection of venom at a dose of 100 mcg. The cholinomimetics arecoline (20 mcg)

and calcium chloride (20 mcl, 0.2 percent solution) were injected into the ventricle of the brain after injection of the venom as body temperature had risen by not more than  $1.5^{\circ}\text{C}$ , but not later than 90 minutes after the injection of snake venom. Sodium salicylate was injected intraperitoneally in two doses of 200 mg/kg--30 minutes before the venom and 90 minutes after its onset of effect, respectively. The animals' rectal temperature (at a depth of 3 cm) was measured using a TAEM-1 electric thermometer. The results were submitted to statistical analysis.

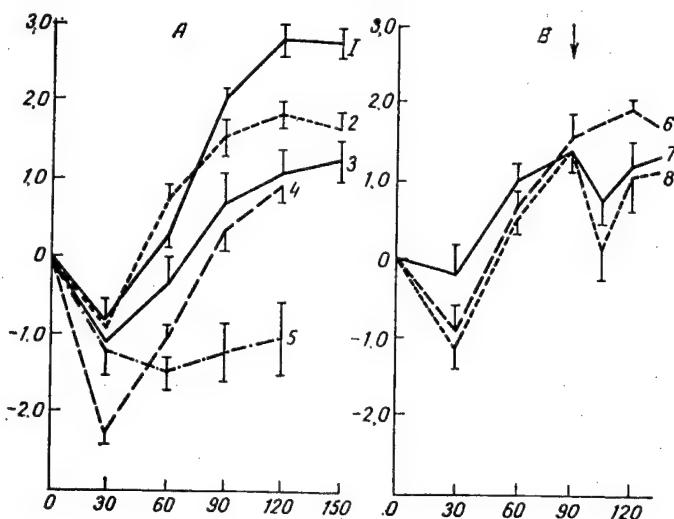
*/Results and Discussion/* In the first series of experiments the effect of snake venoms on the body temperature of rats at different times after their injection into the side ventricles of the brain was studied. The results appear as Figure 1. It should also be mentioned that the central action of Indian cobra venom substantially lowered motor activity: in some rats 1-3 minutes after the injection convulsions occurred and lasted 2-3 minutes. Cobra venom did not raise body temperature in the rats when dissolved in 0.9 percent sodium chloride; the rattlesnake venom at a 5 mcg dose evoked restlessness and aggressive states. A 25 mcg dose, while it did not change body temperature, brought about the death of the animals after 60-70 minutes with toxic manifestations (recumbent side position, convulsions and in some cases rotation around the longitudinal axis of the body). When the viper venom was injected (at a 25 mcg dose) the animals became listless, lay on their sides and died after 90 minutes.

Fig. 1. Effect of Snake Venoms on Body Temperature in Rats



In a second series of experiments, an investigation was carried out of the protein synthesis inhibitors, antipyretics, the cholinomimetic arecoline and calcium ions upon the genesis of hyperthermia caused by the central action of cobra venom. The results are summarized in Figure 2.

Fig. 2. Effect of protein synthesis inhibitors and antipyretics (A); arecoline and calcium ions (B) on the development of hyperthermia in rats caused by the central action of Indian cobra venom.



1. Cycloheximide (100 mcg injected into the ventricles of the brain) + cobra venom (25 mcg)
2. Distilled water (20 ml) + cobra venom (25 mcg)
3. Anisomycin (100 mcg injected into the ventricles of the brain) + cobra venom (25 mcg)
4. Valtoren (100 mcg injected into the ventricles of the brain) + cobra venom (25 mcg)
5. Sodium salicylate (200 mg/kg intraperitoneally) + cobra venom (25 mcg)
6. Cobra venom (25 mcg) + distilled water (20 ml)
7. Cobra venom (25 mcg) + calcium chloride (20 ml 0.2 % solution injected into the ventricles of the brain)
8. Cobra venom (25 mcg) + arecoline (20 mcg injected into the ventricles of the brain). Cycloheximide, anisomycin, valteron and sodium salicylate were injected 30 minutes before the cobra venom. The arrow indicates the time of injection into the cerebral ventricles of arecoline, calcium ions or distilled water (in the control experiment).

The data do not allow us to conclude that the hyperthermal effect of cobra venom is caused by the presence therein of phospholipid A. This enzyme in large amounts is contained in all snake venoms (4), including that of the *Vipera lebetina* and *Ancistrodon halys* vipers and others. However the action of these venoms in our experiments was not accompanied by development of hyperthermia. As yet it is hard to explain why the hyperthermal effect of cobra venom is not observed in the presence of sodium ions, especially since an abundance of the last-named (injection of hypertonic solutions of sodium chloride into the cerebral ventricles) evokes a marked hyperthermia (2,7).

As is well known, inhibitors of protein biosynthesis in animals can attenuate hyperthermic effects of a leucocytic pyrogenesis (6) and in some cases mitigates the fever of disease. According to analysis of our data, the hyperthermal effect of cobra venom, apparently, is not related to the intensification of processes of protein synthesis. Above all, it depends on an action on the central mechanism of thermoregulation, blocked by antipyretics, that is the mechanism of the fever reaction. These, as we have shown elsewhere (3), are regulated by synaptically acting substances, in particular cholinomimetics, calcium ions etc.

#### Conclusions

1. The injection into the ventricles of the rat brain of the venom of the Indian cobra evokes a rise in body temperature. The venoms of the North American rattlesnake and the Central Asian Vipera libetina and Ancistrodon halys do not lead to an effect of this kind.
2. Protein synthesis inhibitors do not affect the hyperthermal action of the Indian cobra venom. This activity is mitigated by antipyretics, arecoline and calcium ions.

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CSO: 1840/267

UDC: 577.352.5:612.822

MECHANISM OF ACTION OF KAINIC ACID ON L-GLUTAMATE RECEPTORS OF RAT HIPPOCAMPUS PYRAMIDAL CELLS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 285, No 5, Dec 85  
(manuscript received 29 May 85) pp 1221-1224

[Article by N. I. Kiskin, O. A. Kryshko and A. Ya. Tsyndrenko, Institute of Physiology imeni A. A. Bogomolets, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] Kainic acid is a cyclic analog of L-glutamate which has stimulating and neurotoxic effects. The hippocampus is particularly sensitive to this substance. Intracellular perfusion and rapid change of external solution was used to study the mechanism of action of kainic acid on the L-glutamate receptors of isolated hippocampus pyramidal cells. The data obtained indicate that kainate cannot activate receptors which have been desensitized by L-glutamate, but the kainate activates the same receptors as L-glutamate but does not cause their desensitization. In the mammal CNS there are several types of amino acid receptors, and N-methyl-D-aspartate is a strong agonist of one of them, whereas other receptors of various types are activated by quisqualate and kainate. Kainate acts on the membrane of the hippocampus pyramidal cells and causes significant steady depolarization, activating but not desensitizing the L-glutamate receptors. This may explain the stimulating and neurotoxic effects of kainate on the central nervous system of mammals. References 10: 2 Russian, 8 Western.

6508/9835  
CSO: 1840/290

UDC: 539.196+541.69

CORRELATION OF ANTIARRHYTHMIC ACTIVITY OF LIDOCAINE-LIKE MOLECULES WITH HYDROPHOBICITY AND POLARIZABILITY. PREDICTION OF FORM OF HYDROPHOBIC GROUPS IN 'OPTIMAL' ANTIARRHYTHMIC MOLECULES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 285, No 6, Dec 85  
(manuscript received 11 Jun 85) pp 1479-1484

[Article by M. V. Volkenshteyn, corresponding member, USSR Academy of Sciences, I. B. Golovanov, A. K. Grenader and G. L. Yermakov, Institute of Biological Physics, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] Antiarrhythmic drugs reversibly block ionic channels and function similarly to local anesthetics. The most important peculiarity of receptors which interact with antiarrhythmics is the presence of a hydrophobic sector where conditions are not right for specific bonding with polar groups. The purpose of the present work was to study the correlation of structure with activity for molecules of the lidocaine series by studying the correlation of activity with hydrophobicity and polarizability of antiarrhythmic molecules and to demonstrate the possibility of its utilization to formulate practically useful suggestions concerning certain details of the structure of the molecules of optimal antiarrhythmic drugs.

References 15: 3 Russian, 12 Western.

6508/9835  
CSO: 1840/292

UDC 616-006-08:[615.017:615.277.3]

EFFECT OF UNITIOL ON TOXICITY OF CERTAIN TUMOR MEDICATIONS

Leningrad VOPROSY ONKOLOGII in Russian Vol 31, No 7, Jul 85  
(manuscript received 11 Mar 85) pp 101-104

[Article by F. V. Donenko, All-Union Scientific Center for Oncology, USSR Academy of Medical Sciences, Moscow]

[Abstract] The effect of unitiol on the toxicity of certain cytostatics was studied. Unitiol contains two SH-groups and is a highly effective antidote to heavy-metal poisoning. Dactinomycin, bleomycin, 5-fluorouracil, and vincristine were intraperitoneally injected into CBA mice. Unitiol in a dosage of 300 mg per kilogram of body mass was injected peritoneally five minutes before and 30 minutes after the tumor medications were injected. Toxicity was evaluated on the basis of lifespan, the number of dead animals, reduction in body weight, and the quantity of leukocytes in the peripheral blood. The data showed that unitiol treatment significantly reduced the acute toxicity of dactinomycin, but substantially potentiated

the acute toxicity of 5-fluorouracil, bleomycetin, and vincristine. The potentiating effects were not expected and obviated the need for further experiments on animals before unitiol can be used for medical treatment. References 9 (Western).

13050/9835  
CSO: 1840/218

UDC 615.213:547.943].015.4.07

ANTIEPILEPTIC EFFECTS OF LOW-DOSE MET-ENKEPHALIN AND RAPID ONSET OF TOLERANCE TO HIGH-DOSE EPILEPTOGENIC EFFECTS

Moscow FARMAKOLOGIYA I TOKSIKOLOGIYA in Russian Vol 48, No 4, Jul-Aug 85  
(manuscript received 16 Oct 84) pp 28-31

[Article by V. A. Gusel, G. P. Vlasov, N. L. Wolf, N. Yu. Kozhevnikova and L. A. Ferdman, Chair of Pharmacology, Leningrad Pediatric Medical Institute; Laboratory of Physiologically Active Substances, Institute of High Molecular Weight Compounds, USSR Academy of Sciences, Leningrad]

[Abstract] Chincilla rabbits were employed in a study to determine the effects of low (0.1 or 1  $\mu$ g) or high (60  $\mu$ g) dose injections of met-enkephalin (ME) into the hippocampus of rabbits with penicillin-induced epileptogenic foci. High-dose ME induced epileptiform activity in the animals. Rejection of the high dose within 5 days failed to induce similar changes in the EEG, indicating the onset of tolerance which persisted for 20 days. Injection of 60  $\mu$ g of ME 5-10 min prior to penicillin administration in the ME-tolerant period also abolished the epileptogenic consequences of penicillin. Administration of low doses of ME had no effect on the EEG, but markedly and in a dose-related fashion reduced penicillin-induced epileptiform activity. In light of the current hypothesis that the epileptiform effects of ME are mediated via the  $\delta$ -receptors and the anti-epileptic via the  $\mu$ -receptors, high-dose tolerance was credited to a mechanism affecting  $\delta$ -receptors, while the  $\mu$ -receptors remained fully responsive to ME. Low doses of ME appear to stimulate only the  $\mu$ -receptors.

References 9: 1 Russian, 8 Western.

12172/9835  
CSO: 1840/264

ENHANCEMENT OF MEMORY TRACE RETRIEVAL IN RATS BY AMANTADINE

Moscow FARMAKOLOGIYA I TOKSIKOLOGIYA in Russian Vol 48, No 4, Jul-Aug 85  
(manuscript received 1 Aug 84) pp 34-38

[Article by L. V. Loskutova and P. Yu. Ilyuchenok, Institute of Physiology, Siberian Department, USSR Academy of Medical Sciences, Novosibirsk]

[Abstract] An analysis was conducted on the effectiveness of amantadine (mindentan) in memory trace recovery, using Wistar rats with an avoidance response to cutaneous electrostimulation. The models employed consisted of psychogenic amnesia [Robustelli, F., et al., *Physiol. Behav.*, 3: 543-547, 1968], latent inhibition [Lubow, Re. *Psychol. Bull.*, 79:398-407, 1973], and 'ordinary' forgetfulness. One hour prior to testing, the animals received intraperitoneal injections of 25 or 50 mg/kg of amantadine. Administration of the lower dose was effective in recovery of the conditioned response after 2 weeks to 2 months of inactivity. Treatment with amantadine was also effective in promoting retention of the response during a period of inactivity. However, the higher dose was required in case of latent inhibition or psychogenic amnesia. The role of amantadine in potentiating memory mechanism is attributed to activation of various dopaminergic pathways, as well as, presumably, other monoaminergic pathways in the brain. References 25: 4 Russian, 21 Western.

12172/9835  
CSO: 1840/264

EFFECTS OF LONG-TERM EXPERIMENTAL PIRACETAM INTAKE

Moscow FARMAKOLOGIYA I TOKSIKOLOGIYA in Russian Vol 48, No 4, Jul-Aug 85  
(manuscript received 27 Apr 84) pp 42-46

[Article by I. Kh. Rakhmankulova, T. L. Garibova, K. E. Voronin, U. M. Tilekeyeva and T. A. Voronina, Institute of Pharmacology, USSR Academy of Medical Sciences, Moscow]

[Abstract] Outbred white mice and rats were employed in a study on the pharmacological consequences of long-term administration of the central stimulant piracetam. Administration of 300-400 mg/kg piracetam per day for 28 days showed no essential effect on the development of conditioned response either with positive or negative reinforcement. Similarly, one-time doses were also ineffective. However, 200 mg/kg/day for 30 days, as well as a single 300 mg/kg dose, was an effective regimen for prevention of development of retrograde amnesia in mice, alleviation of extinction, and for retention of anxiolytic effectiveness and improved emotional reactivity.

Piracetam was without sequelae on the orienting reaction, did not affect coordination, and exerted no sedative or myorelaxant effects.

References 15: 5 Russian, 10 Western.

12172/9835

CSO: 1840/264

UDC 616.36-018.1-02:547.283.2]-085.31:547.458

INCREASED RESISTANCE TO HEPATOCYTES TO  $CCl_4$  FOLLOWING PRIMING OF RATS WITH BACTERIAL POLYSACCHARIDE

Moscow FARMAKOLOGIYA I TOKSIKOLOGIYA in Russian Vol 48, No 4, Jul-Aug 85  
(manuscript received 24 Apr 84) pp 96-99

[Article by A. Yu. Voronin and D. N. Mayanskiy, Laboratory of Pathophysiology, Institute of Clinical and Experimental Medicine, Siberian Department, USSR Academy of Medical Sciences, Novosibirsk]

[Abstract] Confirmatory studies were conducted on Wistar rats to assess the effects of i.p. administration of prodigiosan (*S. marcescens* polysaccharide preparation) on subsequent hepatocytic resistance to  $CCl_4$ . The animals were injected with 50  $\mu$ g of prodigiosan per 200 g of body weight, followed by  $CCl_4$  (40% oil solution; 0.2 ml/100 g, s.c.) in 1, 3, or 7 days in 2, 3 or 4 weeks. Maximal stimulatory effects of prodigiosan on the RES were noted in 24 h and 3 and 7 days after administration, as evidenced by a 5.3-, 5.4- and 4.2-fold reduction in the clearance times for colloidal carbon, respectively, in comparison with control clearance values in untreated rats. Concomitantly, maximal reduction in the centrolobular necrotic areas due to  $CCl_4$  in prodigiosan-primed animals was seen on days 7 and 21, which was also coincidental with the lowest increase in serum alanine amino-transferase activities. The effects of prodigiosan administration on hepatotoxicity were ascribed primarily to enhanced uptake of the  $CCl_4$ -lipid complexes by the hepatoc RES, as well as to enhanced metabolism of gluco- and mineralocorticoids. References 21: 6 Russian, 15 Western.

12172/9835

CSO: 1840/264

UDC 615.22:547.869.2/.015.4:612.115.35

EFFECTS OF ETACYZINE [SIC] ON BLOOD COAGULATION AND ANTICOAGULANT ACTION  
OF HEPARIN

Moscow FARMAKOLOGIYA I TOKSTIKOLOGIYA in Russian Vol 48, No 4, Jul-Aug 85  
(manuscript received 8 Jan 85) pp 112-114

[Article by A. D. Petrov, Chair of Pharmacology, Medical Faculty, People's  
Friendship University imeni Patrice Lumumba]

[Abstract] Experimental studies were conducted on rabbits to determine the anticoagulant potential of the novel phenothiazine antiarrhythmic etacyzine [sic], employing thromboelastographic assessment after a single 1 mg/kg dose. Blood coagulation was seen not to be affected by etacyzine in the model system utilized. However, the blood became refractory to the effects of heparin, with maximal refractoriness observed 45 min after administration of the antiarrhythmic. In vitro studies with blood samples and aqueous solutions demonstrated that the effects which were observed were apparently due to complex formation between etacyzine and heparin, with  $2.0 \times 10^{-3}$  M etacyzine neutralizing 1 U/ml of heparin. References 12: 9 Russian, 3 Western.

12172/9835  
CSO: 1840/264

PHYSIOLOGY

UDC 612.821.2/.3.012-06:577.175.343

EFFECT OF VASOPRESSIN AND ENKEPHALIN ANALOGS ON CHEMOREACTIVE PROPERTIES OF RAT SENSOMOTOR CORTICAL NEURONS

Moscow BIOLOGICHESKIYE NAUKI in Russian No 11, Nov 85  
(manuscript received 15 Aug 84) pp 61-66

[Article by R. I. Kruglikov, B. L. Brodskiy, O. Kh. Koshtoyants, and M. Yu. Markarova]

[Abstract] Conditioned learning of rats is known to be enhanced by injections of neuropeptides. The present article reports on study of the effects of desglycylargininevasopressin (DGAVP) and the cyclic analog of enkaphalin (CAE) on chemoreactive properties of sensomotor cortical neurons of immobilized rats. The mean frequency of basal impulses before and after administration of the neuropeptides showed no significant change, but distribution of neurons according to reactivity to microionophoretic factors was changed markedly. The authors sought to determine mechanisms of changes in activity as a result of neuropeptides by studying correlations between "long" and "average" ganglia packets, concentrating on DGAVP actions since CAE reactions were not distinctive. Results indicated that systemic introduction of DGAVP had little impact on the correlation between ganglia packets and noradrenaline cells. The nature of basal impulses, cell reaction to microionophoretic introduction of acetylcholine and noradrenaline, the structure of impulse activity and the magnitude of correlation bonds between ganglia of varying duration, were found to change markedly with systemic introduction of DGAVP or CAE. These neuropeptide effects were related to the effectiveness of conditioned responses and learning for test rats. References 8 (Russian).

12131/9835  
CSO: 1840/223

UDC 612.014.42:612.816.819.1941

ROLE OF CALCIUM IN NON-QUANTAL ACETYLCHOLINE RELEASE IN MOUSE MOTOR NERVE TERMINALS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 285, No 4, Dec 85  
(manuscript received 13 May 85) pp 1019-1021

[Article by V. A. Voronin and Ye. Ye. Nikolskiy, Kazan Medical Institute imeni S. V. Kurashov]

[Abstract] To assess the role of calcium in non-quantal release of acetylcholine (ACh), electrophysiological studies were conducted on the magnitude of synaptic hyperpolarization (H-effect) of a mouse phrenic nerve-diaphragm preparation in Ringer-Krebs bath with and without calcium ions. ACh degradation was prevented by addition of armin to inactivate acetylcholinesterase, and d-tubocurarine was employed to block cholinoreceptors. The H-effect is obtained not only by the addition of d-tubocurarine, but also when non-quantal release of ACh is inhibited or diminished. Measurement of the H-effect in the synaptic zones of 15-20 myofibrils in normal solutions and those lacking  $Ca^{++}$  at various periods of time after  $Ca^{++}$  removal showed that the observed changes in the H-effect resulted from blockage of non-quantal ACh release. However, the lack of  $Ca^{++}$  has a gradual effect on non-quantal release of ACh, with maximal effect seen in 45-50 min after switching to a  $Ca^{++}$ -free bath. The delay would suggest that  $Ca^{++}$  is involved indirectly in non-quantal ACh release. References 13: 1 Czech, 1 Russian, 11 Western.

12172/9835  
CSO: 1840/254

UDC 615.015.154:615.9

BIOCOMPATIBILITY OF NOVEL LONG-ACTING DOSAGE FORM OF DISULFIRAM

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR. SERIYA B. GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 10, Oct 85  
(manuscript received 15 Mar 85) pp 74-77

[Article by G. A. Pkhakadze, N. A. Galatenko and K. L. Konoplitskaya, Institute of Organic Chemistry, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] Toxicity trials were conducted on a novel form of long-acting disulfiram (tetraethylthiuram disulfide) in polyurethane matrix to determine the eventual suitability of such dosage forms in the treatment of alcoholism. In vitro studies with fibroblast culture derived from outbred rats demonstrated that 20 mg/kg equivalent dose was nontoxic, whereas a dose of 200 mg/kg was highly toxic to the cells. Histologic studies of the sites of subcutaneous implantation of both dosages in outbred rats also demonstrated the innocuous nature of the former, and the extensive necrotic and inflammatory changes induced by the latter dosage. Animals implanted with the 20 mg/kg dose

showed that over the 6 month period of observation the inflammatory site was marked by typical inflammatory changes induced by a foreign body, ending eventually in encapsulation by connective tissue. Neither the released disulfiram nor the products of degradation of polyurethane had any adverse effects on the surrounding tissue. On the basis of these studies, it appears the depot form of disulfiram may constitute a viable avenue for the administration of this antialcoholic agent. References 7 (Russian).

12172/9835

CSO: 1840/293

UDC: 638.2.23

INFLUENCE OF HIGHLY DISPERSED SILICON DIOXIDE ON PRODUCTIVITY OF THE SILKWORM

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 285, No 5, Dec 85  
(manuscript received 5 Aug 85) pp 1235-1238

[Article by M. G. Voronkov, corresponding member, USSR Academy of Sciences, U. N. Nasirillayev, B. A. Parpiyev and V. M. Dyakov, Irkutsk Institute of Organic Chemistry, Siberian Department, USSR Academy of Sciences; Central Asian Scientific Research Institute of Silk Production, Tashkent]

[Abstract] Silatrans have been found to stimulate the biosynthesis of RNA, DNA and protein. Having a broad spectrum of biologic effect, silatrans increase silk productivity of the silkworm. The authors studied the influence of highly dispersed aerosil silica and its solutions in triethanolamine or silatran on the productivity and vital activity of the silkworm. The preparations were administered by treating leaves with colloidal aqueous solutions of aerosil or its solutions in triethanolamine. The silkworms were fed these leaves for three to six days. The data indicate that both of the forms of silica increased the silk production of the worms by 20 to 30%, their viability by 8-15% in comparison to a dry control. References 7: 5 Russian, 2 Western.

6508/9835

CSO: 1840/290

UDC: 612.741

HOW DOES SKELETAL MUSCLE OPERATE EFFECTIVELY IN MAINTAINING A POSE AND IN PHASIC MOTION

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 285, No 5, Dec 85  
(manuscript received 13 Jun 85) pp 1241-1245

[Article by V. S. Gurfinkel and Yu. S. Levik, Institute of Problems of Information Transmission, USSR Academy of Sciences, Moscow]

[Abstract] All muscle fibers of mammals are phasic (twitch) fibers. It is sometimes thought that the slow phasic fibers of mammals are an analog of the tonic fibers of lower vertebrates. However, the motor units of mammal muscles are involved in contraction in more or less fixed sequence, so that the fast twitching fibers cannot be activated separately from the slow ones. There must be another mechanism to modify the contraction of fibers already involved in activity. The purpose of this work was to seek such changes in the contractile process and analyze their functional significance. It is suggested that skeletal muscle works effectively both in maintaining a pose and in phasic modes not only due to the presence of fast and slow fibers, but also because the contractile properties of these same fibers can be modified. The effects described in this article appear within a few seconds and do not result from irreversible structural changes in the muscle fibers. This rapid control of muscle properties may be based on calcium-dependent phosphorylation of a number of muscle fiber proteins. References 12: 3 Russian, 9 Western.

6508/9835  
CSO: 1840/290

UDC: 612.13+612.73

cAMP-DEPENDENT MECHANISM OF RELAXATION OF VASCULAR SMOOTH MUSCLE CELLS IN HYPOXIA NOT RELATED TO DECREASING CONCENTRATION OF  $\text{Ca}^{2+}$  IN MYOPLASM

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 285, No 5, Dec 85  
(manuscript received 20 May 85) pp 1252-1255

[Article A. I. Solovyev, Institute of Physiology imeni A. A. Bogomolets, UkrSSR Academy of Sciences, Kiev]

[Abstract] A decrease in the degree of oxygenation of the smooth muscle cells of veins has been shown to lead to relaxation against a background of stable intracellular  $\text{Ca}^{2+}$  concentration. This work has analyzed possible mechanisms of this phenomenon in the smooth muscle cells of the vessels and the significance of cAMP in these processes. The cells were found to have manifest phosphodiesterase activity preventing increases in cAMP concentration in their cytoplasm. It is assumed that upon hypoxia the activity of the

phosphodiesterase decreases, leading to an increase in intracellular cAMP concentration. The relaxation of smooth muscle cells in the vessels upon hypoxia may thus be related to cAMP-dependent phosphorylation of kinase and disruption of phosphorylation of myosin. References 7: 1 Russian, 6 Western.

6508/9835

CSO: 1840/290

UDC: 621.826+616.831-089.11

STUDY OF ELECTRICAL ACTIVITY OF HUMAN MIDBRAIN NUCLEAR STRUCTURE NEURON ACTIVITY UPON STEREOTAXIC SURGICAL INTERVENTION

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 285, No 6, Dec 85  
(manuscript received 5 Jun 85) pp 1500-1503

[Article by S. N. Rayeva, Institute of Chemical Physics, USSR Academy of Sciences; Institute of Neurosurgery imeni N. N. Burdenko, USSR Academy of Medical Sciences, Moscow]

[Abstract] The use of the microelectrode method in stereotaxic surgery on the ventrolateral thalamus and globus pallidus allows more precise selection of the area of destruction, increasing the effectiveness of surgical treatment of Parkinsonism. This article presents a study of the nuclear structures of the midbrain, which have been shown to be important in processes of coordination of oculomotor, vestibular-oculomotor and vestibular-motor interactions. Results are presented from microelectrode studies of torticollis patients on the nuclear structures of the posterior commissure area and adjacent midbrain formations. The materials obtained allow for the first time a description of the specifics of neuronal organization of the rostral segments of the human midbrain and establish the presence of several different cellular complexes reacting selectively to: 1) spontaneous head and neck movements; 2) spontaneous rapid eye movement; 3) fixation of vision and holding of vision; 4) coordinated movements of the head and eyes. Voluntary head movements or voluntary muscle tension in the neck is accompanied by development of neuronal activation restructuring correlating with the EMG of the cervical muscles. The materials indicate functional heterogeneity and complexity of the neuronal organization of the rostral structures of the human midbrain. The nuclear formations studied are directly related to the activity of several systems supporting coordination and control of voluntary head and eye movements. References 15: 2 Russian, 13 Western.

6508/9835

CSO: 1840/292

PUBLIC HEALTH

BRIEF

IMPROVEMENT OF MATERNITY HOSPITAL CONDITIONS--A. Dontsov, secretary of the Rostov-on-the-Don municipal party committee, has notified the editor that the facts presented by the article "Bitter Lesson", published on October 19, 1985, were valid. All health care organizations of the city discussed the "Pravda" article at party meetings and collective staff meetings. The municipal health care department has carried out a series of measures to guarantee a sanitary-anti-epidemic regime in maternity hospitals, to reinforce their surgical staffs, medium-level and lower-level medical personnel and to obtain necessary equipment and inventory. The CPSU gorkom and gorispolkom are continuing to work on increasing the responsibility of party, soviet and economy workers to ensure that the city's maternity hospitals have normally functioning service. [Answer to article entitled "Bitter Lesson"] [Text] [Moscow PRAVDA in Russian 7 Dec 85 p 3] 12473

/9835  
CSO: 1840/241

## QUALITY OF EYEGLASSES UNSATISFACTORY

Moscow NEDELYA in Russian No 28, 8-14 Jul 85 p 7

[Article by E. Andzelevich]

[Abstract] This article reports widespread public concern over new eyeglass lens designs that have been adopted by the USSR Ministry of Health and are being sold in "Optika" shops and dispensed at clinics. Various ministry-level spokesmen have defended the more modern, larger diameter and different refraction of the glasses. State [GOST] standards have also been revised to meet the new lens designs only recently. The author notes that many of the reported cases of dissatisfaction have been from older wearers, who have long been accustomed to their previous eyeglasses. The author also questions whether imported equipment is used to produce the new lenses; in general, he wonders how new lenses were put into distribution without proper medical testing in broad areas.

12131/9835  
CSO: 1840/2074

## CONFRONTATION OF LITHUANIAN HEALTH MINISTER AND PLANT WORKERS

Vilnius SOVETSKAYA LITVA in Russian 24 Nov 85 p 2

[Article by T. Pushina]

[Abstract] The heads of ministries and departments in the Republic have been appearing recently before the general public in preparation for the 27th CPSU Congress. Recently, the Minister of Health of Lithuania, Y. Platuki, visited a plant in Vilnius. Both successes and shortcomings were discussed. During the 12th Five-Year Plan, 106 public health projects will be constructed. A great deal will be done for the training of physicians, since there is a shortage in Vilnius of dentists, pediatricians, anesthesiologists and dental technicians. The workers at the plant complained to the Minister concerning the work of the Vilnius industrial enterprises polyclinic, long waiting lines, obsolete methods of treatment and other problems. An unpleasant discussion with the head of the polyclinic followed.

6508/9835  
CSO: 1840/253

RADIATION BIOLOGY

UDC 591.1

EFFECTS OF IMMUNOGLOBULINS ON WORK PERFORMANCE OF IRRADIATED ANIMALS

Moscow IZVESTIYA AKADEMII NAUK SSSR. SERIYA BIOLOGICHESKAYA in Russian No 3, May-Jun 85 (manuscript received 24 Apr 84) pp 404-411

[Article N. I. Arlashchenko, Zh. G. Adamchik, A. S. Shtemberg, N. P. Klemparskaya, N. N. Dobronravova, and A. D. Chukhrov, Institute of Biomedical Problems, USSR Ministry of Health, Moscow]

[Abstract] CBA mice and Wistar rats were employed in a study to determine the effects of pretreatment with homologous immunoglobulins on the work performance (swimming), superficial bacterial flora, and survival rates of lethally-irradiated animals. The mice were pretreated with 0.5, 1 or 5 mg/mouse of ammonium sulfate globulin fraction, and rats with 200 mg/kg. Irradiation was from a Cs-137 source at a rate of 2.08 Gy/min for a dose of 5 to 10 Gy. Although pretreatment with the homologous immunoglobulin preparation had no effect on survival rates, in the case of both animal species physical performance was improved, and bacterial flora normalized in the first 10 post-irradiation days. Various avoidance reflexes were better retained by the immunoglobulin-treated animals, indicating a direct effect on the CNS. These observations provide further confirmation for the stimulant action of homologous immunoglobulins in radiation-impaired animals. References 22: 18 Russian, 4 Western.

12172/9835  
CSO: 1840/1018

UDC 535.28:63

RADIOECOLOGY OF DOMESTIC ANIMALS IN RELATION TO ADVANCEMENTS IN NUCLEAR POWER TECHNOLOGY

Moscow VESTNIK SELSKOKHOZYAYSTVENNOY NAUKI in Russian No 4, Apr 85  
(manuscript received 27 Mar 82) pp 116-121

[Article by B. N. Annenkov, A. N. Sirotkin and R. M. Aleksakhin,  
doctors of biological sciences, All-Union Scientific Research Institute  
of Agricultural Radiobiology]

[Abstract] A cursory review is presented of the present state of radio-ecology of farm animals, especially as it relates to the human food chain. With the development of nuclear power technology more and more radio-nuclides enter the environment as pollutants and present a radioecological problem in the agricultural context. The problem is further complicated by the fact that not all radionuclides are adsorbed from the gastrointestinal tract of animals to an equal extent. Some, such as Y, Zr, Nb, La, Ce, Pr and Nd, are characterized by an absorption level of less than 1%. In the case of others, e.g., Mo, I and Cs, 80-100% of the intake is absorbed. However, agricultural radioecology is still in its infancy and much remains to be done to formulate safety standards and preventive measures. In particular, an acute need is felt for long-term studies conducted under natural conditions. References 9: 8 Russian, 1 Western.

12172/9835  
CSO: 1840/1025

UDC: 577.391:547.963.3

REPAIR OF GAMMA-RADIATION-INDUCED SINGLE-STRAND BREAKS IN DNA IN  
MYXOMYCETE PHYSARUM POLYCEPHALUM

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR: SERIYA B: GEOLOGICHESKIYE,  
Khimicheskiye i Biologicheskiye NAUKI in Russian No 11, Nov 85  
(manuscript received 12 Jul 85) pp 62-65

[Article by N. I. Gushcha, A. P. Dmitriyev, Yu. Yu. Malinovskiy,  
D. M. Grodzinskiy, corresponding member, UkrSSR Academy of Sciences,  
Institute of Plant Physiology, UkrSSR Academy of Sciences, Kiev]

[Abstract] Recent works have shown the preferential location of reparative synthesis of DNA in eukaryotes in the nuclear matrix. This article studies the effectiveness of repair of breaks in a single-filament DNA in various phases of the mitotic cycle and the intranuclear localization of this process in the polynuclear myxomycete *Physarum polycephalum*, among the most radiation-resistant organisms. To determine the intranuclear location of reparative DNA synthesis, the plasmodium in the  $G_2$  phase was cut into four

parts. Post radiation incubation of the irradiated plasmodium for 2 hours at 25°C resulted in repair of single-filament DNA break of plasmodium irradiated in the G<sub>2</sub> phase. This is not true of plasmodium irradiated in the S phase. Repair is primarily initiated and occurs with greater speed in DNA segments associated with the nuclear matrix. References 11: 1 Russian, 10 Western.

6508/9835  
CSO: 1840/256

UDC: 577.391:547.963.3

#### INDUCTION OF TUMORS IN ANIMALS IRRADIATED WITH FAST NEUTRONS AT VARIOUS ENERGIES

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR: SERIYA B: GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 11, Nov 85  
(manuscript received 9 Jul 85) pp 73-76

[Article by V. G. Pinchuk, Ye. Ye. Chebotarev, corresponding member, UkrSSR Academy of Sciences, G. G. Istomina and Ya. I. Serkiz, Institute of Problems of Oncology, UkrSSR Academy of Sciences, Kiev]

[Abstract] A study was made of the frequency of development, dynamics of partial distribution and localization of neoplasms in animals after bombardment with fast neutrons at various energies in doses corresponding to the maximum yield of tumors. Two month old white mongrel rats, exposed to neutrons with energies of 1.2 and 22 MeV were used in this study. In the rats bombarded with fission neutrons, the first tumors appeared in the fifth month, most at 10-14 months, maximum at 11 months. In the animals bombarded with the high-energy neutrons, the first tumors appeared in the sixth month, the maximum number at 9 to 13 months, maximum 10 months, with the second massive group of tumors appearing at 22-24 months, maximum 23 months. The major distinguishing features of the carcinogenic effect of high-energy neutrons are: displacement of the beginning of development of tumors to a somewhat later time, double nature of peaks in yield of neoplasms and non-normal distribution over time. Neutron bombardment is found to be highly carcinogenic. References 4: 2 Russian, 2 Western.

6508/9835  
CSO: 1840/256

CONFERENCES

UDC 616-008.922.1-02:615.23:061.3(47+57) "1984"

FIRST ALL-UNION SYMPOSIUM ON "PHARMACOLOGICAL CORRECTION OF OXYGEN-DEPENDENT PATHOLOGICAL CONDITIONS"

Moscow FARMAKOLOGIYA I TOKSIKOLOGIYA in Russian Vol 48, No 4, Nov-Dec 85 pp 118-119

[Article by Professor V.V. Gatsura, Honored Scientist of the RSFSR]

[Text] A symposium that took place on October 10 and 11, 1984 in Moscow at the base of the All-Union Scientific Center for Surgery, USSR Academy of Medical Sciences, was organized by the Administration for Coordination of Investigations on Biological Trials of Chemical Compounds of the USSR Ministry of the Medical Industry under an agreement with the USSR Academy of Sciences. Participants in its work were specialists from 46 SRI's and institutions of higher learning in Moscow, Leningrad, Kiev, Minsk, Kishinev, Kaunas, Riga, Frunze, Voronezh, Gorkiy, Vinnitsa, Grodno, Ustinov, Kemerovo, Kursk, Makhachkala, Omsk and Rostov-na-Donu, including specialists from 9 SRI's of the USSR Academy of Sciences and those of the republics, and from 3 SRI's of the USSR Academy of Medical Sciences, 5 institutes of the USSR Ministry of the Medical Industry, the Military Medical Academy imeni S.M. Kirov and 21 institutes of the USSR Ministry of Health and the RSFSR Ministry of Health.

The work of the symposium was divided into four sections. The papers that were presented reflected accomplishments in the field of molecular mechanisms of pathogenesis of hypoxic and hyperoxic conditions and pharmacotherapeutic methods used to correct them.

At the section "Contemporary Principles of Pharmacological Correction of Hypoxic and Hyperoxic Conditions" 4 program papers and 31 poster presentations were given. New data were brought forward in support of a concept which has priority for Soviet science--that of the biological role of peroxide-free-radical oxidation of lipids as a factor in the alteration of membrane structures in different pathological conditions with detailed analysis of counterindications for the use of antioxidants. The second aspect of the discussion concerned questions of methodology in the evaluation of the anti-hypoxic effect of new compounds on the level of primary and advanced pharmacological research into their specific activity. In the course of discussion, it was suggested that uniform methodological indications be worked out for preclinical investigation of the specific activity of potential antihypoxic agents.

The participants in the section "Orthopharmacological Means in Experimental Therapy of Oxygen-Dependent Conditions" heard and discussed 5 program papers and 39 poster presentations. In the course of discussion it was pointed out that mobilization of the compensatory mechanisms of energy supply (activation of glycolytic production of ATP and designation of intermediates in the Krebs cycle) is an important, as yet only little-used resource in the pharmacological protection of ischemic tissue. There was general support for the practical conclusion that endogenous production of ATP in the Embden-Meyerhof cycle and the associated rise in the survival rate of ischemic tissue depend largely on the development of pH-dependent drug formulations capable of providing activation of electron-acceptor systems at selected points in the zone of ischemia, where the shift of pH to the acid side (up to 6,8-6,3) takes place.

In the section "Experimental Illustration of Current Problems in the Contemporary Pharmacotherapy of Ischemic Myocardia" 5 program papers were heard and 46 poster presentations were discussed. Authors of program papers advanced new approaches to the pharmacotherapy of ischemic cardiac disease, bringing into play inhibitors of peroxide free-radical oxidation of lipids for comprehensive pharmacoprophylaxis and pharmacotherapy of disease, or for example combining easily assimilated metabolites of energy exchange with stimulation of the collateral coronary blood reserve to supply an ischemic myocardia. There was emphasis on the great importance of preventing complications through pharmacotherapy in the reperfusion period and during restoration of cardiac work in cardioplegia. Mention was also made of the need to create antihypoxic agents of selective activity and develop technological means to supply easily assimilated metabolic preparations with high energy potential (fructose-1,6-diphosphate, "Hexosophosphate," succinate, malate etc.)

In reviewing "Pharmacological Problems of Hyperbaro-Oxygenation" the symposium participants in this section discussed 4 papers and 21 poster presentations. A number of key issues with significance for the development of research in this area received detailed analysis. The discussions of program papers and poster presentations emphasized that one of the primary tasks was to create unified methodological recommendations for preclinical investigation of antihyperoxide preparations.

In order that the problems reviewed at the symposium be further investigated, the final session adopted a number of proposals:

1. To approve the initiative of the SRI for Biological Studies of Chemical Compounds in organizing the All-Union Symposium and to consider it appropriate that symposia be held regularly every two years on the topic.  
To request that the Ministry of the Medical Industry and the Ministry of Health of the USSR plan in 1986 to hold a symposium and school for young scholars in 1987 on the same problem in the established series.

2. To ask the Commission on Fundamentals of Medicine, USSR Academy of Sciences and the Scientific Council on Pharmacology and Pharmacy, USSR Academy of Medical Sciences, to review the question of creating an inter-departmental commission on pharmacological correction of oxygen-dependent pathological states and preparing a coordinating program for 1985 and the following years.
3. To request that the USSR Ministry of the Medical Industry--for the purpose of more successful realization of scientific developments and more rapid realization of them in practice--direct the institutions involved in synthesis of medicinal substances to intensify their research on pH-dependent agents with antihypoxic action  
and--with the same goal in mind--that the USSR Ministry of Health concentrate its review of antihypoxic agents in one sector of the Pharmacological Committee. This should bring about more efficiency in decisions regarding the introduction of new agents.
4. To develop unified methodological recommendations for screening and pre-clinical study of the specific activity of antihypoxic and antihyperoxic agents in order that more efficient studies be carried out for the development of new preparations with this type of activity ("Barocenter", USSR Academy of Medical Sciences All-Union Scientific Center for Surgery; SRI for Pharmacology, USSR Academy of Medical Sciences, SRI for Biological Investigations of Chemical Compounds, Military Medical Academy imeni S.M. Kirov, Leningrad Sanitary Hygienic Medical Institute and medical institutes in Grodno, Kishinev and Voronezh).
5. To address a request to the All-Union Institute of Scientific and Technical Information for creation of a department of "Pharmacological Correction of Hypo- and Hyperoxic States" in the scientific review FARMAKOLOGIYA I KHIMIOTERAPEVTICHESKIYE SREDSTVA.

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CSO: 1840/267

GENERAL MEETING OF USSR ACADEMY OF SCIENCES

Moscow IZVESTIYA AKADEMII NAUK SSSR. SERIYA BIOLOGICHESKAYA in Russian No 3,  
May-Jun 85 pp 470-471

[Article by V. A. Strelnikov and V. V. Verzilov]

[Abstract] The General Meeting of the USSR Academy of Sciences was held in Moscow on December 25-26, 1984, and dealt with the realization of the USSR Food Program, the improvement of the wellbeing of the Soviet people, and the contribution that science can make in this regard. In addition to the leadership of the Academy, the meeting was attended by M. V. Zimyanin, secretary of the CC CPSU, academician G. I. Marchuk, deputy chairman of the USSR Council of Ministers, and other members of the CC and heads of ministries and departments. Among the speakers, Academician G. K. Skryabin described contributions of microbiology to the Food Program, such as the development of large-scale production facilities for feed yeast grown on normal alkanes derived from oil. In addition, fundamental studies have been completed for the production of feed yeast grown on lower alcohols (methanol, ethanol), natural gas, and on regional plant resources. Microbial technology is also supplying animal husbandry with some amino acids, vitamins and feeds supplemented with antibiotics, which has had a significant effect on this branch of agricultural productivity. At the present time, the microbiological community is working on producing nutrients for human consumption. In addition, work is continuing on crop plant protection from pests. The meeting concluded with a resolution in support of the decisions of the October 1984 Plenum of the CC CPSU and of the USSR Food Program, and the election of 55 new full members and 112 corresponding members of the Academy.

12172/9835  
CSO: 1840/1018

- END -